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DEVASTATING ORDEAL

RUTHLESS, once again and to shocking extent the sea has taken toll of the lives of many. Great Britain has been ravaged by floods in several areas of the East Coast and the Thames Estuary, though it has not been so sorely stricken as have Holland and Belgium. Later pages give indication of the suffering caused by the onslaught of the sea; they glimpse too the very real help afforded by the gas boards over whose areas the waters flowed so savagely. The gas industry has not been found wanting, and the worth of its efforts has been all the greater as a result of integration and unified control. Most difficult task was that of the Eastern Gas Board, in whose area several works were put out of action for varying periods as a result of water reaching the producers and boiler fires and in one case even the first tier of the horizontal retorts. Lowestoft and Harwich were perhaps the most seriously affected. The former works had, indeed, to be abandoned when the flood water reached a depth of nearly 6 ft. and was not in normal production again till last Friday morning. So wide are the repercussions of a disaster of this magnitude that even the little town of Bungay in Suffolk, far as it is from the sea and served by a butane plant, had its production affected for a time by failure of the electricity supply.

Most tragic perhaps of all stories of the flood was that of Canvey Island in the Thames estuary not far from Southend, where almost the whole area was inundated, with heavy loss of life. The gas supply was, of course, quickly cut off, but in response to requests from the Authorities gas street lighting was restored on Tuesday evening by fitters working from the roof of a van, notwithstanding the leakage of gas from appliances and by-passes which were alight when the flood submerged them. Gas-making ceased at the Southend works of the North Thames Board at 1.20 a.m. on the Sunday morning, due to the interruption of the electricity supply, though the works would very soon afterwards have gone out of production in any case through flooding of the exhausters. Fortunately, Beckton and Romford were able to reinforce the supply and the rerouting of distribution system enabled a service to be maintained, though at reduced pressures.

In the East Midlands area, disaster overtook the Lincolnshire town of Mablethorpe with appalling suddenness. In a matter of half-an-hour the town was inundated to the extent of four or five feet. While the gasworks itself was not seriously damaged and production was not interrupted, the stokers had to carry on working double shift because it was impossible for the relief shift to get to work. Indeed, it was not until the Wednesday evening that all the personnel were safely accounted for. Meanwhile, relief was brought in from the Louth undertaking, from Skegness, Grimsby, Boston and Lincoln. The works being isolated, emergency arrangements had to be made for the staff on duty, and particular praise is due to the wives of the Manager and other members of the staff who stayed on to help although compulsory evacuation of the town had been ordered. These ladies made sure that the men who carried on were provided with hot meals and temporary sleeping accommodation in the works offices.

Along the northern coast of Kent the South Eastern Gas Board had its full share of difficulties, although, thanks to integration, supplies of gas were maintained. Rotherhithe, Rochester, Gillingham and other works were partially flooded, as also were several holder stations, and a certain amount of plant was put out of action for a time.

Even the north of Scotland, with its rugged coast, suffered an extraordinary blow to its little seafront gasworks at Banff, where several pieces of the plant were literally swept into the sea. Part of the understructure of one of the gasholders was carried away and supplies of gas had to be cut off. Emergency plant from Blairgowrie was transported to Banff to provide an emergency supply for the village at the earliest possible moment. A special staff of engineers went to work continuously to put the plant into operation. Other plants down the

east coast of Scotland suffered varying damage, although nowhere so severe as in this instance.

Gas industry personnel in close touch with consumers have many a story to tell of the cheerfulness and courage displayed amid scenes of appalling desolation. But not least among such stories are those concerning the gas workers themselves. Everywhere it was a case of devotion to duty, even when their own homes were under water, of prompt measures in the face of an unparalleled emergency, and of determination to restore interrupted supplies with the least possible delay. Even when the rising waters forced the complete abandonment of a gasworks it was not evacuated before everything had been 'made safe.' In this disaster the gas industry acquitted itself in the true tradition of service which it has built up throughout the long years of its history; and we give our account on later pages of the individual incidents not merely as a record of the facts but rather as a tribute to all those who put service before self.

ANTI-NATIONALISATION

WHILE we respect the opinions and convictions which Mr. A. Spence expresses in his address as President of the Australian Gas Institute, we are not much impressed with what he has to say regarding the effects of nationalisation on the service which the gas industry has to offer in Great Britain. If, he asserts, the British gas consumer was asked about the result of nationalisation, he would without question reply that 'nationalisation' and 'restrictive service' are synonymous terms and that he lives in a nationalised asylum. Mr. Spence has scathing reference to the 'monotonous regularity' which the gas industry has shown in raising prices ever since it was vested in the State, and he prays fervently that Australia will not see a nationalised gas industry.

Whatever may be the arguments about nationalisation of gas in Great Britain it is, to our mind, entirely untrue to say that nationalisation *per se* has been the root cause of higher gas prices, and we are convinced that in the long run integration of supply and unified control will prove of great benefit to the gas consumer. The purpose and spirit which animate our industry remain unimpaired, as, indeed, our record of the efforts made to deal with the flood disaster, referred to earlier in these pages and revealed in more detail later, well shows. But let us consider specifically this accusation that nationalisation has of itself been responsible for placing unnecessary financial burdens on the gas consumer. Latest available figures for the British gas industry show a disposable surplus of less than £1½ mill. on a turnover of £261 mill.—in all conscience a small margin. The price of gas is in fact extremely sensitive to increase in costs of production, and estimated additional costs to the industry over a twelve-month are a matter of nearly £20 mill. (coal, over £9 mill.; rail freights about £3½ mill.; wages and salaries, well over £7 mill.). Of course gas prices have risen since May of 1949; the fact remains that the price level for gas has, in comparison with other essential commodities, been consistently low and has lagged behind. In brief, the charge that nationalisation has resulted in an orgy of extravagance in the gas industry does not need to be defended, though the fruits of integration have yet to be reaped.

GAS IN THE POTTERIES

TOWN gas is playing a great part in the manufacture of pottery, the export of which is doing so much to bridge the dollar gap. In a paper to the Midland Junior Gas Association, Mr. K. Davis, of Stoke-on-Trent, told his listeners something of modern ceramic art and the use of gas in its production. It is gratifying to realise that the majority of manufacturers have already been won over to the advantages of gas as the ideal fuel for their drying or firing operations. Indeed, it is only the present shortage of gas in the Potteries that restricts the installation of many more driers than are already in use. Nor should one forget the enormous contribution which gas has made to lessening the appalling smoke cloud which used to hang above the area.

Some impressive figures were given by Mr. Davis to indicate the progress of gas in the pottery industry. In 1933 the total gas used for the actual firing of pottery was just over 36¾ mill. cu. ft. Four years later this had increased to 515¾ mill.—a 14-fold increase. By the end of 1939 consumption had risen to 1,341⅓ mill. cu. ft. per annum, which figure remained stationary throughout the war years, to rise again in 1947 to 2,156⅓ mill. and by the end of 1951 to the remarkable total of 4,229 mill. At this time no fewer than 187 continuous gas-fired tunnels were in use in the Potteries, which if placed end to end would stretch approximately six miles. Gas used in other processes connected with the industry brings the total quantity up to 5,294 mill. cu. ft. per annum.

Another noteworthy fact is that at the end of 1951 no fewer than 15 factories, with a total of 26 pottery-firing tunnel ovens, having their own producer gas supplier, each had mains, meters, and internal pipes installed to enable them to take town gas as a standby in case of emergency and until such time as a supply could be permanently given. This load can be taken up at very short notice as only minor adjustments are necessary to effect the conversion, the aggregate increment of which would amount to over 1,673 mill. cu. ft. per annum. In fine, it is computed that the change-over from coal firing to gas is equivalent to a saving for the nation of more than two-thirds of the heat energy of every ton of coal previously used.

A PHILATELIST'S DREAM

IN THESE DAYS when the pros and cons of joint meter collection and reading, and consequent joint accounting, are being discussed it is worth noting that because in Manchester both gas and electricity bills continue, as in pre-nationalisation days, to be paid at the same place, the North Western Electricity Board finds it impracticable to give Manchester consumers the benefit of a scheme which, having proved a great success in several districts, is to be

extended to the whole area except Manchester. The scheme, quite simply, enables ordinary consumers to pay their quarterly bills on a stamped card basis. Stamps worth 2s. 6d. each can be bought at an electricity service centre, stuck on a card, and the card presented with the quarterly account as payment. It was started in the Lake District in the middle of last summer, and has since been successfully tried out in other parts of the area. The Electricity Consultative Council was told the other day by Alderman F. Kenyon, its Chairman, that the reason why Manchester must be denied the benefits of the scheme was that the existing arrangements for paying gas and electricity bills prevented electricity accounts being dealt with exclusively by Electricity Board employees. An official of the Board predicted 'serious auditing difficulties' if the scheme were to be used in Manchester.

The Consultative Council pressed that the scheme should be extended to Manchester and a resolution was passed that further consideration should be given to the possible sale of the stamps in the electricity showrooms. If the scheme is so successful for electricity we see no reason why it should not be applied also to gas. And if there is any real danger of confusion over the stamps much the same effect of helping consumers to pay their accounts by easy stages could be achieved by the use of national savings stamps which also have the merit of being sold in smaller denominations and being available at all post offices.

Personal

Mr. W. A. H. Keeley has been appointed General Manager of Montevideo Gas and Dry Dock Company in Montevideo. This has necessitated his taking up residence in Uruguay and therefore relinquishing his seat on the board and resigning his position of Managing Director.

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Mr. James Napier retires at the end of next month from the post of Manager of the Crieff District, Perth Group, of the Scottish Gas Board. In 1917 he succeeded his father, who served with the Crieff Gas and Light Co. for 40 years. Mr. Napier's retirement therefore severs a family connection of over 76 years with the Crieff gas undertakings.

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Mr. J. A. Drake, Chairman and Managing Director of Drakes, Ltd., constructional gas engineers, Halifax, who has been appointed President of the Halifax and District Engineering Employers Association, has many other interests in Halifax. He has been a member of the Halifax Bench since 1950. He is Chairman of the local Conservative Association and also Junior Vice-President of the Halifax Club. He has been Chairman of the Halifax Agricultural Society since its formation in 1946.

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Mr. C. R. Averill, Jun., has been appointed Resident Director in Scotland of C. R. Averill, Ltd. Mr. Averill, Jun., joined the Company in 1939, and since 1945 has graduated through the laboratory, office routine, etc., and more recently held the position of Works Director. He will commence his duties in Scotland on March 2. Since the Company moved its Head Office and Works to Caergwrle, near Wrexham, which is in a development area, it has extended its paint manufacturing facilities on the most up-to-date lines, and has installed the most modern graphite grinding and refining plant.

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Mr. A. V. Horsfall, ASSOC.M.INST.GAS E., has been appointed Sales and Service Manager to the West Midlands Gas Board in succession to Mr. J. Tudor Rees. Mr. Rees will be retained by the Board in an advisory capacity. Mr. Horsfall joined the Gas Light and Coke Company in 1921, and during his apprenticeship underwent practical training in the Westminster workshops (the forerunner of the present-day Watson House training shops), on the district, and in the works and laboratories. He received his technical training at the Westminster Technical Institute. In 1927, he was appointed District Sales Representative and successive posts as Service Supervisor and Deputy Public Lighting Superintendent followed. On the outbreak of hostilities in 1939 he was seconded to the Distribution Department for special duties in connection with Civil Defence on the Central London trunk mains area. Two years later, he joined H.M. Forces, serving at home and in India, Burma, and Malaya as a Squadron-Leader on Fighter Control duties. Returning to the Gas Light and Coke Company in 1946 he became Public Lighting Superintendent and later Service Manager to the Central London Division, North Thames Gas Board. In September, 1950, he obtained the post of Deputy Sales and Service Manager to the West Midlands Gas Board.

Mr. S. Robson, late of the Sunderland gas undertaking, has been appointed to represent Cannon (Holdings), Ltd., in the Eastern part of the North Eastern Gas Board, and in the whole of the Northern Gas Board area.

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Mr. W. F. Thorne, B.SC., A.R.I.C., M.INST.GAS E., has been appointed Technical Officer to the Southern Gas Board, and has taken up his duties at the Board's offices at 164, Above Bar, Southampton. Since vesting date Mr. Thorne has been engaged as production engineer to the Board's Western division, and before that was for many years Chief Chemist to the Bournemouth Gas and Water Company.

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Colonel Harold Smith, Chairman of the Gas Council, who was awarded a K.B.E. in the New Year honours, was the guest of present and former members of the Gas Council at a dinner at the Connaught Hotel, Carlos Place, on February 3. Present members of the Council attending were Mr. H. F. H. Jones (Deputy Chairman), Sir Andrew G. Clow, Mr. E. Crowther, Mr. D. P. Welman, Dr. R. S. Edwards, Mr. S. Smith, Mr. G. le B. Diamond, Mr. T. Mervyn Jones, Sir John W. Stephenson, Mr. M. Milne-Watson, Mr. W. K. Hutchison, Mr. A. R. McBain, Mr. C. H. Chester, and Mr. F. G. Brewer (Secretary). Former members present were Sir Edgar Sylvester (past Chairman), Colonel W. M. Carr, and Mr. O. R. Guard.

Obituary

DANIEL MAYON HENSHAW

The death occurred on February 6, in London, after an operation, of Mr. Daniel Mayon Henshaw, Chairman and Joint Managing Director of W. C. Holmes & Co., Ltd., aged 69. Mr. Henshaw was educated at the Merchant Venturers Technical College in his native city of Bristol, where he served an apprenticeship in mechanical engineering before joining the firm of Holmes in 1903. He served on the Council of the Society of British Gas Industries, of which he was Chairman in 1935, and was for 20 years a member of the Livesey Committee of Leeds University representing the Institution. He was also a founder-member of the Gas Research Board and served as a member of the Council of the Institution.

He was a member of the Gas Gallery Committee of the Institution of Gas Engineers which he founded in company with the late Mr. Thomas Hardie, whom he succeeded as Chairman for a short time following the last war, but resigned due to ill health in favour of Mr. F. M. Birks. He was always a keen supporter of the I.G.E. Benevolent Fund and served for some time as a member of the Committee. The distinction of

Honorary Membership of the Institution was conferred on him last May at the annual meeting. He was joint founder of the William Cartwright Holmes Scholarship tenable at the University of Leeds.

Mr. Henshaw was a member of the Newcomen Society and an antiquarian. Outside the gas field he had been Chairman of the West Riding Group of the Engineering Employers' Federation Committee and of the Huddersfield Engineering Employers' Council, President of the Huddersfield Engineering Society and Huddersfield Society of Model Engineers, a member of the Council of the Huddersfield Y.M.C.A., of which he was also a Trustee, with a special interest in boys' clubs, and a member of the Board of Governors of the Huddersfield Royal Infirmary.

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The death has occurred of **Mr. Charles Butterworth Newton,** of Park Avenue, Hull, at the age of 93. Starting as a pupil with the Shrewsbury Gas Company, Mr. Newton became Assistant Manager, and was later Assistant Manager of the Sheffield Gas Company, afterwards becoming Engineer at Rotherham and Gas and Water Engineer to the Carlisle Corporation.

Diary

Feb. 14.—Scottish (Eastern) Juniors: Short Paper Day; Dundee.

Feb. 17.—London and Southern Section, I.G.E.: 'Preventive Maintenance with Particular Reference to Gasworks Plant,' W. Morland Fox. 17, Grosvenor Crescent, S.W.1. 2.40 p.m.

Feb. 18.—Institute of Fuel: Joint Meeting with Stanlow Branch of the Institute of Petroleum. 'Methane at Point of Ayr Colliery,' J. S. Young. Grosvenor Hotel, Chester. 7.30 p.m.

Feb. 19.—Midland Juniors: Half-day Visit to Joseph Lucas (Electrical), Ltd., Birmingham.

Feb. 19.—Eastern Section, I.G.E.: Short Paper Day: 'Automatic C.V. Control,' K. R. Mortimer. 'The Trend of Gas Consumption and its Effect on the Future,' A. Collinson. 17, Grosvenor Crescent, London, 2.30 p.m.

Feb. 20.—London Juniors: 'Plastics,' J. M. J. Estevez, 6.30 p.m.

Feb. 21.—Yorkshire Juniors: 'Spectroscopy in the Gas Industry,' P. Egan, Harrogate.

Feb. 25.—Scottish (Western) Juniors: Evening Visit: Glenpatrick Carpet Factory, Johnstone.

Feb. 25.—Western Juniors: Visit to Works of Lysaghts, Ltd., Bristol.

Feb. 26.—North Thames G.C.C.: Caxton Hall, Westminster, 2.30 p.m.

Feb. 26.—Midland Section, I.G.E.: Joint Meeting with Institute of Sewage Purification; 'Further Experimental Work on Gasworks Liquor Treatment,' A. J. Clifford and J. T. Rees; Birmingham Chamber of Commerce, 2.30 p.m.

Feb. 28.—Manchester Juniors: Annual Dinner, Lyme Park, Disley, Cheshire.

Mar. 3.—East Midlands G.C.C.: Leicester and County Chamber of Commerce, Granby Street, Leicester, 11.30 a.m.

March 3-28.—Ideal Home Exhibition, Olympia. Gas Council stand No. 70, Grand Hall, ground floor.

March 7.—Scottish (Eastern) Juniors: Joint meeting at Glasgow. Paper by W. K. Tate, Junior Vice-President, Institution of Gas Engineers.

March 11-12.—Gas Sales and Service Conference, Seymour Hall. (For full programme see *Journal*, January 14, p. 91.)

SPECIAL REGULATIONS concerning the safety, health, and welfare of iron and steel foundry employees are to be made by the Minister of Labour and National Service. The draft regulations include provisions about gangways, the removal of dust and fumes, protective clothing, bathing facilities, clothing accommodation, and stacking and storing equipment and tools.

MORE BOYS are now entering the coal mining industry in North Wales than at any time in the last 20 years, said Mr. T. Rogers, Labour Officer for the North Wales Area of the North-Western Divisional Coal Board, at Gresford Colliery recently, when certificates were presented to 120 boys who have completed their training.

THE BOARD OF TRADE has made an Order under the Distribution of Industry Act, 1945, creating a new development area embracing part of North-East Lancashire and a neighbouring area in the West Riding of Yorkshire. If the Order is approved by a resolution of each House of Parliament, the area will be known as the North-East Lancashire Development Area, and will include Nelson and Colne, Barrowford, Brierfield, Padiham, Trawden, Briercliffe, Foulridge, Hapton, Simonstone, Burnley, Barnoldswick, Earby, and Salterforth.

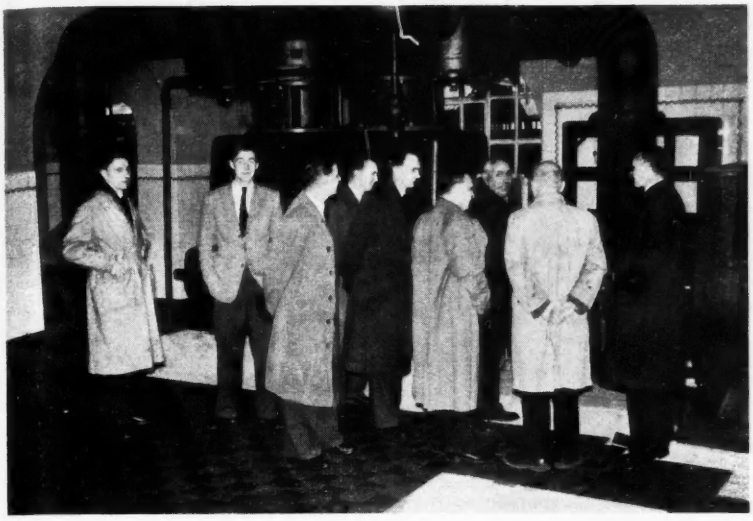
BRITISH STANDARD for Aluminium Filler Alloys for Brazing (B.S. 1942:1953) is complementary to B.S. 1,723, and to B.S. 1,845. The standard covers four types of aluminium alloy suitable for brazing a number of alloys complying with the series of British Standards for aluminium and aluminium alloys—namely B.S. 1,470 to 1,477, and 1,490. Chemical composition and limits of impurities together with the form of material are specified, and the approximate melting ranges are given for information. Copies of this standard may be obtained from the British Standards Institution, Sales Branch, 24, Victoria Street, London, S.W.1, price 2s.

MEMBERS OF THE INSTITUTION OF GAS ENGINEERS are invited to attend a meeting of the Society of Chemical Industry, Newcastle-upon-Tyne Section, Chemical Engineering Group and Corrosion Group, to be held in the Stephenson Building, King's College, Newcastle-upon-Tyne, on Wednesday, February 18, at 2.30 p.m., when the following papers will be presented: 'Some recent progress in corrosion research,' by W. H. J. Vernon, O.B.E., D.SC., and 'Protective coatings for buried pipelines,' by K. A. Spencer, B.SC., and H. B. Footner, PH.D. Dr. Vernon's paper will be presented at 2.30 p.m., and after the discussion (at approximately 4.30 p.m.) the Stephenson Building will be open for inspection. Light refreshments will be served at 5.30 p.m., and the paper by Mr. Spencer and Dr. Footner will be presented at 6 p.m.

THE VIEWS OF THE BRITISH IRON AND STEEL FEDERATION upon the Iron and Steel Bill and current criticism of the industry are set out in a new pamphlet, *The Policy for Steel.* The Federation stresses that the industry's policy is: (i) Competing effort between individual firms; (ii) co-operative activity where this can usefully aid the progress of the industry as a whole; (iii) control over the industry in those matters where the public interest must be the final determinant. 'Constructive action in these three inter-related spheres is necessary,' the Federation states, 'if the industry is to tackle successfully the problems imposed by the scale of modern industrial production and by the need to harness jointly individual effort and public responsibility.' Copies of the pamphlet may be had on application to Steel House, Tothill Street, London, S.W.1.

A FILM recently produced by the Mechanical Handling Engineers Association under the title of 'Conveyors as your Servants,' can now be obtained on loan, free of charge. The film was devised to serve as a supplement to the documentary film 'Mechanical Handling,' relased in 1948, and it indicates some of the extensive possibilities of application of mechanical means for the movement of all types of materials and goods in all industrial processes. The media adopted for explaining the use of mechanical handling equipment include a university library, a major cablegram station, a food industry installation, breweries, and manufacturers of railway wagon springs, cycle components, wool, and car bodies. The number of applications of mechanical handling which could be included was limited by the length of the film—namely 36 min. Much of the equipment portrayed is, however, readily adaptable to a wide variety of uses. 'Conveyors as your Servants' is a 16 mm. film, in colour, with a sound commentary, and applications for prints on loan should be made to the Association at 94, Petty France, London, S.W.1.

WESTERN JUNIORS VISIT TORQUAY



Members of the Western Junior Gas Association recently visited the Hollacombe works, Torquay, of the South Western Gas Board. The photograph was taken in the engine room and shows a new 250,000 cu.ft. per hour compressor.

Gas Board Apologises

THE Scottish Gas Board was accused of gross negligence by Mr. D. I. Davies, of Dundee, at the Sheriff Court on January 20. The Board was suing him for £15 6s. 9d., the balance of an account in respect of a circulator, but when the case was called, Mr. R. S. May, solicitor for the Board, intimated it had been withdrawn.

Mr. Davies asked Sheriff Cullen if he might say something as he thought the matter should be brought to the attention of the Court. He produced a letter of unqualified apology from the Board, because the bill had been paid weeks ago, before the summons was issued. He thought it showed gross negligence on the part of the Board.

Sheriff Cullen agreed the letter certainly contained a full apology. Mr. Davies added that immediately he received the summons he informed the solicitor concerned and also the Board that the bill had been paid.

Mr. May pointed out that this was the first calling, and the case could not have been withdrawn any sooner. There was no doubt that it was due to a mistake on the part of the Board that instructions were served.

North Thames Film Shows

DURING the past 12 months, the North Thames Gas Board established post-war records for the number of film shows given by the Board and for the total audience attending from the educational, social, and welfare organisations in the Board's area.

Altogether 861 film shows were arranged by the Board during the year, attracting an aggregate audience of 80,548, with an average attendance of 94 at each show. The area figures are:

Divisions	Film Shows	Total Audience
Northern	232	27,104
Western	148	13,630
North Western ...	132	10,885
Eastern	125	11,480
Central	67	5,925
South Western ...	50	3,032
Districts		
Southend	59	4,746
Commercial ...	16	1,215
Hornsey	13	1,050
Romford	11	739
Lea Bridge ...	7	700
Chertsey	1	42
Totals ...	861	80,548

Record weekly figures were set up during December 15-20, 1952, when 41 film shows were staged for a total audience of 8,235. Although the total number of shows given is about 10% more than the previous year, the aggregate audience figures increased by more than 30%. During the film season (which is about nine months of the year as there is very little activity during the summer months of June, July, and August), the Board averaged about 20 film shows a week.

As each show usually consists of half-a-dozen films, the year's work represents a screening of more than 5,000 films.

Scottish Building Centre

COLONEL G. GARDNER-McLEAN, who presided at the 15th annual general meeting of the Scottish Building Centre at Glasgow on January 29, stated that during 1952 the many activities carried on in the centre had been successfully maintained and developed. In acting as a link between the manufacturer with a specialised product and a specialised knowledge, and the potential user who required to be informed of both of these, the centre had continued to offer a valuable service both to technical and trade people and to the general public.

More than 18,000 people visited the centre during the year, and the number of enquiries dealt with by the technical staff exceeded 9,000.

Colonel Gardner-McLean expressed satisfaction that the centre had been increasingly recognised as an ideal place for meetings of technical societies and other bodies connected with building. The provision of accommodation for these functions without charge was another way in which it had been possible to implement the fundamental aim of the Building Centre to be as widely useful as possible.

Special short-period exhibitions covering every aspect of building have been of interest to architectural and building trade people, and have attracted much attention from the general public.

Whist and Dance

THE annual whist drive and dance of the Huddersfield/Halifax group was held on January 20. Mr. H. Maud (Halifax), as chairman of the group Sports and Social Committee welcomed the Mayor and Mayoress of Halifax. The Mayor, Alderman W. Regan, extended a civic welcome to the visitors. He was also present in his capacity as Chairman of the North Eastern Gas Consultative Council.

The visitors included Dr. R. S. Edwards, Chairman of the North Eastern Gas Board, and Mrs. Edwards, and group general managers, district engineers and managers, and group officials and their wives.

Mr. B. Watson, secretary of the group central sports committee, introduced Mr. J. G. Tilley to present his award for the best all round undertaking in the sports club activities over the previous 12 months. The result was a tie between Spenborough, previous holders of the trophy, and Brighouse, this award being made and assessed on an equal basis for large and small undertakings in the group, and also being subject to annual competition.

Whist prizes were presented to the winners by Mrs. Edwards. Mr. and Mrs. Carlton (Huddersfield) officiated as M.C.'s for dancing, and Mr. T. Horsfall Mr. P. Huckman, and Mr. G. Farmery (Halifax) were M.C.'s for whist.

By Arrangement with the East Midlands Gas Board, a series of lectures on the principle and installation of the Sapphire balanced flue heater were given by Mr. R. Boorn, Sales Manager of Cowper Penfold & Co., Ltd., to the sales and fitting staff of the Doncaster, Barnsley, Worksop, Rotherham, and Wath-on-Dearne gas undertakings.

Practical Approach.—At the invitation of the South Eastern Gas Board, East Surrey Division Sales Discussion Group, a talk was given in January by Mr. M. H. Thornton, Water Heater Sales Manager, Radiation Group Sales, Ltd., on the practical approach to storage water heating. The talk was well attended, and an interesting discussion took place.

The Story of THE FLOOD

Devotion to Duty in the Face of an Unparalleled Emergency

Photo by Southend Standard

Outside the Southend Gasworks the morning after

Seldom in a lifetime does a disaster of the magnitude and ferocity of the recent floods along our eastern seaboard strike our country. In giving the following factual account of the effect of the inundation on gas production and supply in various areas, we have very much in mind the many stories of devotion to duty, of prompt measures to meet an unparalleled emergency, and of that true tradition of service which the industry has built up throughout the long years of its history.

Canvey and Southend

MOST tragic, perhaps, of all stories of the disaster was that of Canvey Island, in the Thames estuary not far from Southend where almost the whole area was inundated, with heavy loss of life. When the water reached a depth of several feet the gas supply was turned off at the high-pressure holders by the resident inspector and two fitters who had gone out in a dinghy.

In response to a request from the Authorities, gas street lighting was restored whenever possible on Tuesday evening by fitters working from the roof of a van. It is clear, however, that this restoration of the supply resulted in some leakage of gas from appliances and by-passes which were alight at the moment when the floods submerged them. This and the task of cleaning up all the affected appliances are problems still to be faced.

First reports of the flooding of the Southend works of the North Thames Gas Board came at 12.40 a.m. on Sunday morning. By 1.20 a.m. gas-making ceased owing to the electricity supply being cut off; but had this not occurred the works would very soon afterwards have gone out of production through flooding of the exhausters.

As soon as the seriousness of the position was realised supplies from Beckton were stepped up, and later this additional supply was reinforced from Romford. Nearly three times the normal quantity came through from Beckton. Good work on the part of the distribution department in re-routing supplies enabled a service to be maintained, though at a seriously reduced pressure, in spite of the Southend works being completely 'out'—and this without detriment to the peak Sunday morning demand throughout the rest of the Board's area.

After lunch on Sunday the holders began to build up and pressure had increased to 1½ in. W.G. by 4.50 p.m., and to 4 in. by 7 p.m. Shortly before this, the works began making water gas and by midnight coal gas manufacture was re-started. For a time the vertical retort driving gear had to be operated by hand.

The East Coast

As would be expected, the coastal districts of the Eastern Gas Board bore the full brunt and fury of the storm, and flooding was extensive and serious. First intimation of the impending crisis in this area was at 6.30 p.m. on the Saturday when the Norwich Division reported water rising at King's Lynn.

By 10 p.m. it had risen to 2 ft., reaching the producer arches and shutting down the coal gas plant. Fortunately, however, there had recently been put to work a new water gas plant, sited on slightly higher ground than the rest of the plant, and this kept production going. The Lancashire boiler was put out, but the Economic boiler, by reason of its higher fuel bed was kept in steam. So great was their devotion to duty in this crisis that a number of the night shift men remained at work throughout Sunday morning although they knew that their own houses were in 3 or 4 ft of water. No one in King's Lynn was without gas at any time, and by Sunday afternoon, thanks to the untiring effort of the staff the water was pumped out of the pits and the coal gas plant restarted.

At Lowestoft the position rapidly became much more serious. By 10 p.m. the works were under 3 ft. of water, which extinguished producer and boiler fires and reached the first tier of the horizontal retorts. By midnight the works were completely flooded and had to be abandoned—but not before the foreman and one or two of the night shift men had been right round making everything safe.

The Lowestoft works remained unapproachable till Monday morning, and even then it was not possible to get gas production going again until some water gas plant was started up on Wednesday. This in itself was a remarkable achievement considering the depth of water on the works had reached nearly 6 ft. As soon as possible over 100 fitters were drafted into the town (including men from Watford and Tottenham) to restore consumers' supplies and check all appliances.

Very much the same conditions, though not quite the same depth of water, prevailed at both Yarmouth and Gorleston. At the latter, production from the installation of vertical retorts was maintained, although there was a short shut-down due to mechanical failures. At Yarmouth, supplies were for a time restricted, but thanks to the public spirited action of two large industrial consumers who shut off their own supplies so that domestic consumers could have all there was, conditions were almost normal by midday Monday.

Harwich Supply Off

At Harwich the situation was for a time very serious, for owing to the inundation of a low-lying area of the town meter connections were broken and the whole supply had to be shut off. Before supplies could be restored—which was not until Wednesday afternoon—the submerged area had to be isolated and riders taken direct from the works mains

Disconnecting gas services to wrecked chalets at Shoeburyness.

to feed the higher sections of the town; this rendered the holder station, which is some ¼ mile distant from the works, largely inoperative. Similarly at Felixstowe the holder station was put completely out of action, though it was eventually contrived to get supplies into the town through the works governor.

In other parts of the Eastern area the floods caused emergencies at the gasworks. For example, at the little town of Bungay, where it might be thought that both distance from the sea and the use of butane plant would render the town supply safe, the failure of the main electricity supply affected production for a time, though normal working was resumed on Monday. Parts of the town of Aldeburgh were badly flooded, but by mid-day on Monday the gas supply was normal. At Ipswich, water reached a level of 2 ft. in the works and was within 3 in. of the boiler fires.

At Colchester there was for a long time nearly 2 ft. of water in the works, putting out both water gas plant and boilers and flooding the coal elevator pits. Reduced pressure was made good by additional gas being fed in from Chelmsford. Normal working conditions were largely restored by Monday morning.

Aftermath

It is not only the sudden overwhelming catastrophe of a flood which makes the tragedy. It is the fact that only the most obvious effects are immediately apparent, while progressive havoc continues to be wrought beneath the swirling waters and remains after they have subsided. While it is the proud claim that few, if any, consumers who needed gas went without it in this disaster, there will be an enormous task before the Board to make good the effect of water on appliances and equipment which were completely submerged for many hours, and even days, not only in the district but in the works.

We have already mentioned the devotion to duty of the men at Lowestoft. This was no isolated example. In the small hours of that Sunday morning many night shift men at different works found themselves facing a crisis unparalleled in their experience—and in the true spirit of service which is traditional in our industry they rose magnificently to the occasion. In the Eastern area, six men at the Harwich works lost their homes, while those of 30 men at King's Lynn were seriously damaged. Fortunately there were no casualties among employees. Incidentally, the Board's St. John Ambulance detachment from Tottenham was sent to assist in the rescue work on Canvey Island.

The Position in Kent

Flood water entered the Rotherhithe works of the South Eastern Gas Board and surrounded the waste heat boilers in No. 2 retort house with a consequent temporary partial failure of the steam supply. The electric generators could not be run and retort charging was suspended from 2.0 a.m. to 6.0 a.m. In addition, the Le Fleuve pump No. 1 retort house was flooded and put out of action for some hours. The reduction in gas made amounted to some 5,000 therms only; the stock was not affected materially and normal supplies were maintained throughout the Metropolitan Division.

The Belvedere gasholder station gave rise to more anxiety than any incident in the area. The river bank was breached in at least two places within half-a-mile or so of the station and the flood water spread rapidly to a depth of 2 ft. 6 in. over the surrounding marshes, rising in the low-lying districts to 4 ft. 6 in. The whole of the gasholder station was inundated, putting the boiler plant out of action and sterilising the compressing plant which pumps forward marginal gas supplies to Dartford and Gravesend. Supplies were diverted from East Greenwich through the alternative high-pressure main route via Sydenham, and normal district pressures were maintained. This may be partially due to a drop in consumption as a considerable number of dwellings were evacuated and the largest industrial consumer, the Callender Cable Company, was temporarily out of action. Fire pumps have been maintained pumping water from the boiler and compressor houses between high tides, but as each high tide level is reached the river water pours through the breached river bank and no effective steps can be taken until the bank is repaired.

At the Gravesend works the sea defences held and only a small amount of water infiltrated the works. Gasmaking continued normally. The Dartford station was indeed fortunate as the sea defences were washed away but the incoming water turned in a direction away from the station.

Untiring Effort

Gillingham works was flooded in the low-lying parts; in the vertical retort house the motor driving the coke band conveyor, which is fixed in a pit, and the coke extractor motors at ground level were flooded and put out of action. Untiring effort on the part of the technical staff and electricians enabled the motors to go to work in a few hours and gasmaking was not seriously affected. Benzole storage tanks became partially buoyant and some coke and oxide were swept into the river. Normality was restored within about 36 hours.

At Rochester water rose in the retort house to the fourth step of the producer grates and, at a lower level of the works, in the mess room, to table-top level; part of the coal stock was washed across the works. None of the vital plant was touched, however, and production continued normally. At both Rochester and Gillingham foresight shown in raising the sea defence walls recently to a minimum of 16 ft. about Datum (Newlyn) certainly prevented serious incidents.

The Isle of Sheppey was completely cut off from the mainland by a heavy deluge and was approachable only by Admiralty Service boats. The electricity and telephone services ceased, but a one-way telephone line was established between the gasworks and Rochester. Gasmaking continued throughout.

Considerable flooding occurred in both Herne Bay and Faversham but each gasworks was normal. The chief need was the changing of damaged consumers' meters, etc., and six additional fitters were drafted in from Margate. In the Thanet Group some flooding was experienced on all the works, but not so severe as to affect production plant. The jetty of Margate Pier was carried away, resulting in the fracture of a 3 in. diameter main, but as this was valved there was no serious loss of gas.

Mablethorpe Works Isolated

Most seriously affected town in the East Midlands area was Mablethorpe, in Lincolnshire. The first indication of the flooding was received by the Local Manager at Louth who reported to the Group Manager, Grimsby, that the whole town was under water and the population was being evacuated. No telephonic communication with Mablethorpe being possible, contact was made with County Police Headquarters in Lincoln, as a result of which the Divisional Engineer was sent out on a reconnaissance and arrived at Mablethorpe at approximately 2 a.m. on Sunday. The Group Manager from Skegness with his Distribution Superintendent had arrived some few minutes previously.

At this time the water which had been up to the level of the bottom of the primary air slides on the retort house producers had receded somewhat and there was no immediate danger to the works until the following high tide at about 7.30 a.m. The gas-making position was under control due to the fact that the stokers had remained on duty and subsequently worked a double shift.

Due to the depth of the flood water in the streets and the wind force it was deemed impossible to make a reconnaissance of the district until daylight. With the limited staff available, emergency measures were taken to sandbag the doorways to the retort house and a pump was obtained from Skegness. Immediately a lorry driver reported for duty during Sunday morning steps were taken to trace stokers particularly, and any staff remaining in Mablethorpe, and at the same time one or two remaining Gas Board families were evacuated by Gas Board transport. It had been impossible to report back to Division during the night, since the works telephone had ceased to operate, but contact was made with the Divisional General Manager from a phone box at Withern between 6 and 7 a.m. on Sunday morning, and arrangements were then made for the drafting in of two stokers from Louth to cover the afternoon shift.

Tracing Staff

Effort during Sunday was mainly concentrated on ensuring the manning of the gasworks by tracing staff. During these operations the gasworks lorry became waterlogged in the town. This lorry was recovered during the afternoon as a result of a request to the Army Authorities at Alford, but was out of action for two days due to water in the sump.

The Distribution Engineer commenced a survey of the Mablethorpe district on Monday, and at the same time all main cocks to which access was possible were closed and tightened. Several broken services, mainly on the front were capped. At 1 p.m. on that day the Distribution Engineer, Skegness Distribution Superintendent, the Mablethorpe Distribution Superintendent and the Mablethorpe mainlayer proceeded to Alford and obtained a 'Duck' from the military headquarters, and commenced a survey of the Sutton district. This survey established that the high-pressure main was still intact; several broken services were again isolated and cut-off. A number of meters were salvaged.

From lunch time onwards on Monday attention was paid to providing accommodation for the works staff, most of whom had by this time reported for duty, and six beds, 36 blankets, vegetables, tins of meat, tea and sugar were taken through from Lincoln during the afternoon.

Sand, cement, and sandbags were obtained from Grimsby and sandbagging of the danger points on the works was commenced at approximately 4 p.m. Skegness mainlaying gang who had been withdrawn from the district carried out this work. The showroom clerk had salvaged the showroom cash, amounting to approximately £60 on the morning of Sunday, and during Monday afternoon, he reported by telephone that this had been placed in the safe at Alford.

When the flood water had receded, immediate steps were taken to make a survey of the town, as comprehensive as possible, and also of all the houses from the aspect of safety and security. Before the town is re-occupied, there is a tremendous amount of work to be done in connection with mains, services and replacement of meters, and the necessary personnel will be drafted into the town, and steps have been taken to provide accommodation for sleeping and feeding.

Up to the present, the Lincolnshire Division has been able to cope with the situation, but the resources of the other Divisions within the East Midlands Gas Board have been placed freely at the disposal of the Division and will be utilised as the occasion demands.

There is nothing to record from the Northern Gas Board's area where damage by flooding was relatively slight. Similarly, the North Eastern area was generally unaffected save for the washing away of a 6-in. main near Whitby, cutting off the gas to 66 consumers. A temporary main quickly restored the supply.

Plant Swept into Sea

The gasworks at Banff stands close to the sea on a rocky part of the coast line. During the storm on Saturday night and early Sunday morning the abnormally high tide and stormy sea overcame the sea wall at the end of the gasworks yard, flooding the works and carrying back into the sea the exhausters, washer, scrubber and tar pumps. The condenser was also washed off its base and carried over to the edge of the yard. The exhauster house was destroyed and sea water entered the retort house to a level sufficient partially to extinguish the producer fires. The foundations of the main gasholder and of the blue water gas relief holder were undermined and left in a dangerous condition.

As the plant which was washed off its foundations could not be recovered for use it was necessary to seek immediately replacements. It was fortunate that suitable plant had just been dismantled at Blairgowrie in Perthshire and urgent arrangements were made to convey this to Banff. The despatch from Blairgowrie was carried out very expeditiously and the plant arrived at Banff in the early hours of Monday morning. A local firm of civil engineering contractors commenced on the Sunday to repair the gasholder foundations and to provide foundations for the other plant. It is considered that the work so far done on the gasholder foundations has made them safe. Foundations for all other plant have now been completed and connections are being made.

It was anticipated that a supply of gas would be restored to the town by February 10.

Flood water surging through the railway cutting swept away the concrete piers supporting this 24-in. gas main at West Thurrock, near Grays, Essex. The baulk of timber seen on the right was hurriedly put in pending permanent repairs.

The Task Ahead

Such, then, is the story of the flood as we have been able to piece it together from information readily forthcoming from the various Gas Boards concerned. To say that a disaster of this magnitude overtakes us but once in a lifetime would be an understatement. Once every 500 years might, perhaps, be nearer the mark. The defences of low-lying land against the sea have grown up through many centuries; in Kent, the first of them were built by the Romans. They were primarily designed to protect agricultural land from flooding. These defences have only once been seriously breached, and that was in the 14th century. Even in the great storm of 1703 they were not as badly damaged as they were last week.

A great deal still remains to be told—particularly of the enormous task which lies before the Gas Boards in restoring supplies to domestic premises which have been inundated. For example, of the first 500 meters inspected in Southend, more than 100 had to be replaced, and many more have been replaced since then. Even the coins in the slot meters had to be cleaned before being banked. And all submerged appliances must be cleaned and tested. But that is another story, not appropriate to this purely factual report of the disaster as it immediately affected the individual areas. We have every reason to be proud of the way the personnel of all grades rose to the occasion in the true spirit of service which has always been a tradition of our industry.

IN PARLIAMENT

Increased Pensions for Ex-Municipal Employees

WIDESPREAD satisfaction will be felt among the large number of retired employees of former municipally-owned gas undertakings that the question of their pensions has now been resolved. Ever since it became apparent that the provisions of the Pensions (Increase) Act, 1952, did not cover such categories, hon. Members have been pressing relentlessly in the House for their pensions to be brought into line—as the many Questions which we have reported in this column have indicated.

Following further enquiries at Question time on February 2, Mr. GEOFFREY LLOYD (Minister of Fuel and Power) stated that he was prepared to agree to amendments to their pension schemes so as to give these ex-employees benefits comparable to those given under the 1952 Act. He had no doubt that the Gas Boards would act speedily in this matter and it was his intention that these benefits should be retrospective from the same date as they began in regard to the Act.

The Minister's statement, while generally welcomed throughout the House, immediately led to a request that similar consideration be given to pensioners formerly employed by private gas companies in view of the fact, as Miss IRENE WARD (Tynemouth) put it, that they also had to contribute in general, through indirect and direct taxation, towards the pensions of the former employees of municipal authorities.

Mr. LLOYD was not prepared, however, to go further at this stage and pointed out that his statement related only to the question of statutory pension increases—which Miss WARD considered 'very unsatisfactory.'

Nutty Slack

Ever since the curious material known as nutty slack was introduced to the long-suffering British public it has been the subject of a good deal of caustic criticism and facetious comment. It has been stigmatised as being of extremely poor burning qualities, of comprising much too much slack, dust and dirt, and far too few nuts, of producing an increase in fogs, and, indeed, amounting to 'barefaced robbery' at more than 5s. a cwt. —this last castigation from Mr. W. HAMILTON (Fife, West) when the subject was raised in the House on February 2.

Mr. GERALD NABARRO (Kidderminster) had started the hare with a request to be told the calorific value of nutty slack currently marketed to domestic consumers by the N.C.B. compared with normal house coals.

Mr. LLOYD, who admitted that he himself was a user of it, said its calorific value is about the same as that of the lower quality house coal groups (which many domestic consumers will consider pretty low). It was unfortunate, he added, that in some districts some rather bad qualities of this type of coal were distributed in the first instance, but he understood that had now been put right. In his opinion it was useful, particularly in cold weather, to eke out supplies of ordinary coal. We feel that hon. Members remained unconvinced.

Mr. Geoffrey Lloyd admitted that he himself was a user of nutty slack.

Capital Investment

Mr. NABARRO asked the Minister of Fuel and Power what were the amounts of capital investment respectively in the nationalised coal, gas and electricity industries during the year 1952, excluding the North of Scotland Hydro-Electric Board.

Mr. LLOYD, in a written answer, said that accurate answers could not yet be given for 1952, but it was estimated that total capital expenditure by the N.C.B. was approximately £45 mill. (of which about £40 mill. related to collieries), by the area gas boards £50 mill., and by the B.E.A. and area boards £150 mill.

Power Stations: Thermal Efficiency

Mr. NABARRO also asked the Minister the average thermal efficiency of B.E.A. power houses in 1952; and what directions he would give to improve coal utilisation arrangements at power houses.

Mr. LLOYD said he was informed by the B.E.A. that the average thermal efficiency of their generating plant in 1952 was 22.6%, based on the returns for the months January-November and an estimate for December. He did not propose to issue any general directions on this subject.

Municipal and County Statistics

WE have received copies of three separate publications dealing with health, welfare, and children services statistics for 1951-52. These booklets are published jointly by the Institute of Municipal Treasurers and Accountants and the Society of County Treasurers. Each return contains statistics relating to the health, welfare, and children services provided by all local authorities throughout England and Wales, and each is similar in form to that published last year.

The Local Health Service Statistics show the net expenditure of each authority over the various services provided under the National Health Service Acts, 1946 to 1951, expressed as a cost per 1,000 population, and the unit costs of operation of certain of these services.

The Welfare Services Statistics relate to the various welfare services administered under the provisions of the National Assistance Acts by local authorities throughout England and Wales. Columns 7 to 10 of the return give details of the numbers of persons accommodated and persons on the blind and deaf and dumb registers, columns 11 to 25 show an analysis of net expenditure and grants per 1,000 population and columns 26 to 66 show an analysis of costs per resident week of various classes of residential homes provided by local authorities.

The Children Services Statistics relate to the various children services administered by local authorities in England and Wales under the provisions of the Children Act, 1948, and the Children and Young Persons Act, 1933. The return is similar in form to *Welfare Services Statistics* and includes columns showing the number of children in care, an analysis of expenditure and grants per 1,000 population, and an analysis of costs per week of residential homes and nurseries provided by the authority.

The Address of the Establishments Division of the Ministry of Fuel and Power is now Thames House South, Millbank, London, S.W.1. The telephone number of the Ministry, Abbey 7000, and the telegraphic address, 'Minfupo, Sowest, London,' remain unchanged.

Maiden Voyage of M.V. GUILDFORD

On Sunday, February 1, the South Eastern Gas Board's new collier, the GUILDFORD, completed her maiden voyage from Newcastle to Wandsworth

The 'Guildford' arrives at Wandsworth.

THE Mayor and Mayoress of Guildford (Councillor D. Wilkins, J.P., and Mrs. Wilkins), accompanied by the Deputy Mayor and Mayoress, the Town Clerk and the Borough Surveyor and their wives, were welcomed abroad the *Guildford* at Limehouse pier by the Chairman of the Board, Mr. W. K. Hutchison, and completed the last stage of the maiden voyage to the Board's Wandsworth works. Dame Vera Laughton Mathews, D.B.E., and Sir Wilfred Ayre, Chairman of the Burntisland Shipbuilding Company, Mrs. W. K. Hutchison, Miss A. Hutchison, and Mr. A. G. Gostelow (Coal and Shipping Manager) were also in the party.

During the run up the river, the Mayor of Guildford presented the ship with a plaque bearing the Guildford coat of arms.

On arrival at Wandsworth, the *Guildford* was greeted by the Mayor and Mayoress of Wandsworth (Mrs. Christine E. F. Callingham, J.P., and Mrs. Geoffrey Scoular), Mrs. R. S. Johnson (Deputy Chairman of the Board), Mrs. Johnson, Miss Johnson, Colonel C. M. Croft, and a number of the Board's officials and their wives.

At a brief ceremony in the Boards' Wandsworth offices, a toast was drunk to the ship, and the Mayor of Guildford, thanking the Board for 'an exciting day,' said that he thought the *Guildford* was a really wonderful ship—quite different from any other collier he had ever seen or heard about. The Mayor referred to the plaque bearing the Guildford coat of arms which he had, on behalf of the town of Guildford, presented to the ship, and said that the plaque was a happy thought and a permanent link between the town and the collier. The Mayor wished good fortune to the *Guildford* and all who sailed in her.

A Proud Moment

Captain T. W. Corney, M.B.E., the Master, who replied, said that it was a proud moment for him. He did not think such an honour had ever been bestowed before on a collier. The *Guildford* was the last word in comfort, and that comfort was combined with efficiency.

The Chairman, Mr. W. K. Hutchison, proposing the health of the Boroughs of Guildford and Wandsworth, said that the Boroughs played a very big part in the life of the Gas Board; the Board, following the practice of pre-nationalisation days, had named their new ships after the boroughs they served. The Board was very proud that its newest ship would carry the name of the Borough of Guildford on its journeys from the Tyne to London River. An efficient fleet, by bringing coal as cheaply as possible from the north, helped the Board to give its customers an efficient service.

The Mayor of Wandsworth said she was proud to have had the opportunity of looking over the Board's wonderful collier. She said that they wanted to see that all the industries in the Borough were successful, because their success was the Borough's success also. For many years past, they had had a happy relationship with what they called the 'old gas company,' and she hoped that with the new organisation of the Board they would carry on in the same spirit.

The *Guildford* was built by the Burntisland Shipbuilding Company, Ltd., and launched by Dame Vera Laughton Mathews, D.B.E., a member of the Gas Board, on November 17 last (see p. 617 of the *Journal* of December 10).

The Mayor of Guildford, Councillor D. Wilkins, J.P., presents a plaque bearing the Guildford coat of arms to Captain Corney, M.B.E., Master of m.v. 'Guildford.' From left to right: Mr. W. K. Hutchison, Chairman of the South Eastern Gas Board, Mrs. Hutchison, Captain Corney, M.B.E., Dame Vera Laughton Mathews, D.B.E. (who launched the ship), the Mayoress of Guildford (Mrs. D. Wilkins), the Mayor of Guildford (Councillor D. Wilkins, J.P.).

The Sunderland Shipbuilding Firm of S. P. Austin & Son, Ltd., announces that it will launch the 2,700-ton motor collier Thomas Livesey in June for the North Thames Gas Board. This vessel will also be fitted with machinery at Sunderland—a Clark-Sulzer engine supplied by George Clark (1938), Ltd. Austins are due to start work soon on another collier for the Board, but this vessel will be 4,600 tons and fitted with steam machinery by the North-Eastern Marine Engineering Co. (1938), Ltd., Sunderland.

The Production and Use of benzole formed the subject of a review in a recent World Oil Industry supplement published by the *Financial Times*. After a survey of the methods of production, the article stated that the quantity of crude benzole produced yearly at gasworks is about 27 mill. gal., from some 260 gas-making plants, of which the ten largest refine their own production. In addition, there are about 80 coke oven plants producing crude benzole amounting to a total of some 66½ mill. gal. per annum. The major portion of the benzole recovered in Great Britain is sold in mixture with petrol, as a motor fuel. The article stressed that the benzole industry should be maintained in a healthy and thriving condition during peacetime because it is vital to the country's defence programme.

Electrical Flashes

. . . . *News and Views of Current Events in the Electricity Supply Industry*

Private Power Generation IT HAS BEEN announced by the British Electricity Authority that, as stated by the Minister of Fuel and Power in the House of Commons on November 24, the electricity boards intend to implement one of the Ridley Committee's recommendations on private generation. This suggests that electricity boards should publicly and permanently abandon restrictions on the period during which private generating plant could be run, in cases where the main supply to the factory was from the electricity board.

If any consumer desires to use public plant in circumstances which would contravene the provisions of his agreement with the electricity board concerned, the board will be prepared to enter into a new contract which will reflect the costs of connecting and supplying the consumer while leaving him free to use his private plant.

In connection with the last part of this statement, it is of interest to note that the Ridley Committee also recommended that the principles on which prices would be fixed for standby supplies should be stated.

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Special Night Rates AN OFFER of cheaper electricity at night has been made by the South Western Electricity Board to industrial and commercial consumers. Officials of the Board announced the plan in Plymouth, where large works and offices, especially those in course of construction, will be encouraged to install modern thermal storage plant.

The scheme represents an effort to make the most use of new generating plant installed during 1952. It is being pointed out that thermal storage plant, combined with efficiency of generating plant running at night when older plant is shut down, will help to gain the best use of the country's coal and power-plant resources.

The *Electrical Times* understands that the price of electricity used between 10 p.m. and 7 a.m. will range from 0.5d. to 0.375d. a unit, according to consumption. There is to be an additional sum to cover the increased cost of coal. A slightly increased price will apply to 12 hours' use between 7 p.m. and 7 a.m. There will also be other concessionary rates for combined day and night use.

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Development Groups in S.W. A DETERMINED effort to counter the many critics of electricity is being made by the South Western Electricity Board. For some three years now there have been Electrical Development Groups in the area, intended primarily to iron out differences and problems which were bound to arise subsequent to nationalisation between the Board and local contractors. Their aim is also to promote the use of electricity and latterly to refute all arguments favouring other types of fuel to the possible exclusion of electricity.

One such group exists in the Bath district, and this has now taken the enterprising step of inviting the public to some of their meetings. This action appears to have been well rewarded by the presence of about 50 'outsiders' at the first public meeting. On this occasion, Mr. R. W. Steel, the Board's district manager at Bath, said he had no qualms whatever in advising the use of electricity in off-peak hours. There was, he said, still need for economy in peak periods, but during the last financial year, the Board could have sold 150% more electricity than it did without having to use any more plant.

Other similar development groups are active in Bristol, Taunton, Exeter and Truro, to mention but a few in the Board's area. (*Electrical Times.*)

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Heat Storage Radiators A MEANS has been developed to enable electricity to be utilised for space heating purposes without affecting the power demand at peak periods. It is based on the Continental practice of using, for reasons of economy, a small fire to heat a mass of brickwork which gives out its stored heat to the surrounding air and thus provides background heating over a long period.

By the use of concrete and a small specially designed electric element mounted in a simple sheet-steel case, the General Electric Company has obtained the same effect. These electric thermal storage radiators are designed for use on a time-switch-controlled circuit so arranged that the radiators draw their power during the night and convert this current into heat for the following day's space heating.

The heaters have a maximum charging period of eight hours. Their heat output expressed as a percentage over 24 hours is 35% during the eight-hour charging period, 56% during the day, and the remaining 9% in the last eight hours. The heat emitted during the charging period provides a comfortable room temperature at the start of the day. The heater weighs 480 lb., but is constructed so that it can be dismantled for transport.

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Inadequate Return LOCAL authorities in the East Midlands Area Board have been criticised by members of the Electricity Consultative Council (states the *Electrical Review*) for withholding freedom of choice in domestic services from the tenants of council houses. Mr. C. R. King, Chairman of the Electricity Board, putting the Board's point of view, said that it was quite uneconomic for the Board to connect new houses at a cost of about £6 each if electricity was used for lighting and radio only. If the local authorities 'economised' by cutting down installations they would have to be asked for contributions towards the cost of providing electricity.

Trading Policy Criticised A PROTEST has been made by the Central Committee of Scottish Chambers of Commerce to the South East Scotland Electricity Board and to the Ministry of Fuel and Power against an increase in the retail trading activities of area electricity boards since 1948. The committee states that the primary function of the boards is to distribute electricity. Much ill-will is being engendered among traders by their present trading policy.

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Starlings Have the Laugh STARLINGS have become a nuisance in some districts, and various methods of getting rid of them have been tried in Birmingham, according to a recent note in *The Times*. Experiments were made with electrified wires, but the birds had sufficient sense to keep off. Then a beam of ultrasonic waves with an effective range of 50 yards was tried, but the starlings dodged it and roosted comfortably elsewhere. They also ignored ultra-violet rays which were used in the hope that the unusual appearance of one bird to another might cause fighting. Personal appearance, however, does not seem to cause any concern among starlings and so far the birds 'have had the laugh.' Has anyone thought of gassing them?

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Bathos in Planning BANKSIDE 'B' has gone on load. This is the first half of the new Thames-side power station which will have an ultimate capacity of 240 MW. The proposal to build this station, located adjacent to the original Bankside station, and designed to spread over much of the original site, was the cause of much criticism and, indeed, a public enquiry. However, consent was obtained, a satisfactory design—by Sir Giles Gilbert Scott—was approved, and subject to the conditions that the station should be oil-fired and gas washing plant installed, building commenced shortly after the end of the war.

Commenting in the columns of the *Electrical Times*, 'Meteor' observes that when the new Bankside station was no more than a project not yet on the drawing board, it was subjected to the bitterest of opposition. Such a building of substantial size and utilitarian purpose should not be allowed to vie with the mighty St. Paul's itself. Today the first half of the station is complete. Here is to be seen the tender care of architectural design, the grandeur of the broad viewpoint, the minutest attention to detail. Surely, never, on such a costly site, have space considerations been so freely ignored; there has certainly been no skimping which might interfere with the architectural beauty of a building which was to form part of a grand new scheme of South Bank development. Today this building stands surrounded by corrugated iron sheds, garbage wharves and refuse barge moorings. All this in the sacred name of planning!

INDUSTRIAL GAS ON SHOW

Bristol Exhibition Largest of its Kind

ALMOST ambitious exhibition of industrial gas equipment has been staged in Bristol by the South Western Gas Board. It is claimed that this is the largest exhibition of its type to be held in Britain. Opened by the Hon. L. W. Joynson-Hicks, M.P., Parliamentary Secretary to the Ministry of Fuel and Power, 'Gas in Industry,' as the exhibition is called, presents in the Drill Hall, Old Market Street, Bristol, a comprehensive range of modern gas industrial equipment which will appeal particularly to industrialists and factory personnel, but which must also be a source of great interest to the general public. The demonstrations include glass working, flame hardening, pottery throwing, continuous brazing and metal profiling, and it is important to note that there are some 30 'live' exhibits. A section of the exhibition contains a number of animated display panels which illustrate the process of gas manufacture and by-product recovery. The exhibition opened on February 10 and will remain open until February 21.

The exhibition is part of a plan devised by the South Western Gas Board to offer a modern fuel service to all industrialists in the area, in conjunction with a new industrial gas tariff introduced in September, 1952, after consultation with industrialists and the Consultative Council; under this tariff material reductions in costs of production and distribution arising from a steady demand are passed on to consumers. The production of an exhibition of this nature on such a large scale must be regarded as a move of the greatest significance, and the Board is to be congratulated on its excellent publicity, staging, and the wide range of exhibits. Manufacturers have responded nobly, and the following notes will serve as some guide to the appliances on show. Rather than attempt to classify exhibits under definite headings, we list the exhibitors alphabetically.

The Aeromatic Co., Ltd., have on show a striking range of flame failure and ignition devices, together with magnetic valves, air temperature controls, and thermostats.

Bratt Colbran, Ltd., deal with their products on no less than three stands. The first features the well-known wedge pattern garage type heater for use where there is a risk of inflammable vapour. The second stand shows the luminous panel heater for factories, churches, and open type buildings, while the third exhibit is the incinerator.

Chance Bros. & Company have a popular draw in their glass working exhibit. Their stand also shows a selection of burners suitable for glass blowing and manipulation.

Controlled Flame Boilers, Ltd., have a working exhibit—an 8 S. boiler suitable for a maximum working pressure of 120 lb. p.s.i., with an evaporative capacity of 349 lb. per hour. This model has a pressure-stat, float switch incorporating automatic water feed by Conflux electrically driven feed pump, and low water alarm, together with automatic low water gas shut off.

Controlled Heat & Air, Ltd., exhibit a gas-fired recirculation oven. This furnace has been designed for the recirculation of hot air from high velocities, giving very high figures for transmission, together with close temperature control limits.

Thomas de la Rue, Ltd. (Gas Division) have three exhibits: (i) An infra-red tunnel with conveyor and variable speed motor for high speed stoving, drying blacking on small cores on a continuous basis; (ii) a batch type drying oven for painted components, the heat source being at the top and bottom as well as the two sides; and (iii) examples of spray painted articles dried in gas-fired infra-red tunnels.

Dowson & Mason Gas Plant Co., Ltd., show a gas immersion heated thermostatically controlled steel plate tank arranged with an outer wrapper enclosing insulating slabs which retain heat when shut down for a short period. Included is a weir-type overflow combined with a drain and a perforated air-pipe for connecting to the compressed air supply.

Electrolux, Ltd., exhibit their now well-known laundry equipment—washing machine, hydro extractor, and laundry truck. The washing machine can handle 22 lb. dry weight in one operation and heats its own water to correct temperature of 180°F., or to boiling point if required.

A. E. Griffiths (Smethwick), Ltd., show their direct gas-fired natural convection oven complete with relay type thermostatic control. This is suitable for enamelling, japanning, core drying, and drying-off after plating or pre-treatment, etc.

Hancock & Co. (Engineers), Ltd., exhibit the well-known 'U' arm Universal oxy/town gas cutting machines which have the advantage of five forms of alternate drive. Four sizes are available, each being capable of producing accurate cutting from $\frac{1}{8}$ in. to 8 in. thick plate.

The **Harris Engineering Co., Ltd.**, are attracting a good deal of attention with their well-known gas-fired unit air heater with forced convection. On another stand the company shows a gas-fired air heater suitable for connecting to ducting to provide an inexpensive plenum heating system; alternatively, this unit could be adapted for drying operations up to 1,000°F.

The **Horstmann Gear Co., Ltd.**, exhibit their non-electric flame failure device operated by differential temperature which, being non-mechanical, is almost indestructible.

The **Incandescent Heat Co., Ltd.**, show a heat treatment furnace for general purposes up to 1,000°C. in which flame contact is avoided by firing under the hearth tiles. The furnace is fitted with a patent Nicrotectile metallic hearth for use under arduous conditions which would decrease the normal refractory hearth life.

Jackson Boilers, Ltd., exhibit a café set incorporating the well-known Jackson boiler, fitted with Pyrex lined milk and coffee urns forming a self-contained still-room set, utilising the Filomaton.

The **J.L.S. Engineering Co., Ltd.**, show a hot air circulating oven, the function of which is to give an accurate temperature in the working space and perform the correct treatment required by items to be processed, and is particularly suited for tempering.

Keith Blackman, Ltd., exhibit a comprehensive selection of burner equipment suitable for installation in all types of combustion chambers. Special burners are included for use in confined spaces, such as baking ovens, platens, internally heated rolls, etc.

Manesty Machines, Ltd., show an automatic water still where the water is pre-heated by the condensing steam to almost boiling point, the vapour being directed to prevent entrainment of raw water and ensuring a high quality distillate.

Meldrums, Ltd., show the No. 'O' size cast iron destructor which is capable of burning refuse having a moisture content of 20% at a rate of approximately 35 lb. per hour. The gas burner equipment is of the bunsen type fitted with a cowl to prevent choking with refuse, having a regulating cock and air control disc for connection to a 1-in bore gas supply.

Perl Controls, Ltd., exhibit a set of flame failure and ignition devices, together with magnetic valves, air temperature controls and thermostats.

Radiant Heating, Ltd., feature a new type of crucible furnace specially designed by the East Midlands Gas Board. This furnace makes use of radiant burners instead of the more usual tangential firing, with the consequent increase in pot life. It is suitable for all temperatures up to 1,400°C.

Radiation Group Sales, Ltd., have two stands. The first contains a special display panel accommodating gas blow-pipes, bunsen burners and industrial burner injectors, as well as natural draught low pressure burner injectors and a No. 2 laundry stove specially suited for laundry classes in schools. The second stand is devoted to large scale catering equipment.

Radiovisor Parent, Ltd., show the Flamestat Equipment Type FR.49 for use on gas-fired installations, ranging from central heating boilers to high temperature industrial furnaces. The equipment comprises a control unit and a flame electrode of a special alloy which projects into the flame.

Selas Gas & Engineering Co., Ltd., exhibit a Selas G.L.C. gas-fired muffle furnace No. 145/4 Type 'A,' with ½ in. burner inlet. The maximum gas rate of 75 cu. ft. per hour enables a muffle temperature of 1,000°C. to be reached in 60 minutes, and the maintaining gas rate is 60 cu. ft. per hour. A Type No. 150/2 stove type is also shown.

Sperryn & Co., Ltd., show a thermostatic demonstration model which illustrates the operation of a T.W. 702 'Spersom' thermostat in conjunction with a G. 800 diaphragm type control valve. Another demonstration model shows the application of a 'Spersom' G. 805 thermomagnetic flame failure valve to a single gas burner.

Standard Telephones & Cables, Ltd., exhibit models of their 'Stanelco' electro gas equipment, which provides an intense localised heat for soldering, brazing, annealing and hardening processes. Flame varying from a pin point to 1¼ in. wide ribbon can be obtained with the range available. A unit is arranged to give a continuous demonstration of the automatic switching from pilot to heating flames.

James Stott & Co., Ltd., have an excellent display of catering appliances, including an Autofry frying range, a standard vegetable boiling pan, an Imperial and an Empire hotcupboard, and a selection of water boilers and café sets ranging from the high efficiency Senior café set to the completely automatic Regula café set and Magna boiler. An Autoheater and sterilising sink are also shown.

William Sugg & Co., Ltd., exhibit their well-known incinerator for use in factories, business houses, department stores, hotels, etc.

Surfard, Ltd., show flame hardening by Peddinghams oxy/town gas flame hardening machine. The gear to be hardened is rotated between oxy/town gas burners of special design, and when it reaches the pre-set temperature it is lowered into the quenching medium and the burners extinguished. If required, the hydraulic control and extinguishing of the flames may be effected electrically by the Milliscope, thus rendering the whole operation automatic.

Thermic Equipment & Engineering Co., Ltd., feature the Thermic double ended section heating furnace, standard size SH.—1. This is a small portable unit for regular or intermittent heating for bending of steel sections, rails, flats, etc.

A. H. Wilkes & Co., Ltd., exhibit a most compact brazing hearth complete with integral air compressor blowpipes and air cooling.

Bingley Rating Committee is recommending Bingley Council to apply for an increase in the assessments of the local gas undertaking. Following a report by the Chief Rating Officer, the committee proposes to increase the assessments on land, works, holders, mains, etc., as well as on the gas showroom, from £54 to £205 rateable value, and a further suggestion is that the Council should serve notice of appeal to the Valuation Court against any objection raised to these proposals by the North Eastern Gas Board, and should also lodge an objection against any proposals by the Board to reduce its assessments.

ECONOMIES FROM INTEGRATION

AN example of the economies resulting from the integration of gas supplies was quoted to the Middlesbrough Division Consumer Committee on February 2 by Mr. J. W. Pallister, the Divisional General Manager, who referred to the use being made of surplus plant by interchange between units and divisions.

Following the closing of the Guisborough works, dismantled plant is being transferred to the Darlington Division, said Mr. Pallister. An additional exhauster required at Redcar is being provided from surplus plant at Darlington and an additional condensing plant needed at Skinningrove is coming from surplus plant at Redcar. The usual practice formerly was to scrap displaced plant and replace with new, whereas the Northern Gas Board has arrangements for full information to be available in all Divisions thereby allowing the best use to be made of all displaced plant.

Mr. Pallister reported that the Teesside grid system was proving of increasing value in the operational efficiency of the Division and of the neighbouring Stockton Division. Daily supplies were provided from Middlesbrough to South Bank and smaller supplies periodically to Redcar and Stockton. It is of interest to note that supplies to Redcar are made during the periods when part of the purifiers at Redcar are laid off for emptying and refilling. Had it not been possible to provide an outside supply, additional capital would have been necessary for an extension of the purifying plant at Redcar, as also would have been the case at South Bank.

It is proposed to install distance pressure and volume indicators on the gasholders and governors at Guisborough so that indications can be observed and controlled from the Redcar works, thus converting the Guisborough works to a fully automatic gasholder station with no attendants. Before this work can be completed, however, it will be necessary to re-sheet the crowns of the two gasholders, and arrangements are in hand for this work to be carried out. Following the introduction of a bulk supply of gas to Guisborough from the Teesside grid, a detailed investigation is being made of district pressures. The entire distribution system was in a very unsatisfactory state prior to nationalisation. Main, service pipes and meters were of inadequate size and partially restricted by deposits. Pressure tests have now indicated a number of these stoppages and as they are located sections of main are being cut out and the obstructions cleared.

At Middlesbrough the new one million cu.ft. per day carburetted water gas plant is nearing completion, Mr. Pallister stated, and should be in operation in March. Progress was being maintained on all new housing estates in the Division though difficulties were experienced owing to the shortage of cast iron pipes under the new allocation scheme. Up to the present time no new houses had been kept waiting for lack of a gas supply.

B.G.S.A. Meeting

AT a special meeting organised by the Bournemouth Branch of the British Gas Staff Association on January 28, over 100 staff employees of the Bournemouth gas undertaking assembled at St. Peter's Hall, Bournemouth, to hear an address given by Mr. P. Valon Bennett, M.C., T.D., M.INST.GAS E., Industrial Relations Officer of the Southern Gas Board.

In his address, Mr. Valon Bennett outlined facilities for further education within the gas industry. He also stressed the importance of being able to settle any problems at undertaking level emphasising the desirability of joint consultation. Following the address the speaker dealt with questions raised and stressed the importance of putting something into a business as being the surest way of getting something out of it.

Among invited guests present were Mr. J. C. Hogg (General Manager of the Bournemouth gas undertaking) and other senior officials. Mr. Hogg, in proposing a vote of thanks to Mr. Valon Bennett, confirmed that good relations existed with the local branch of the British Gas Staff Association, and in seconding this proposal, Mr. W. F. Carter (Branch Hon. Secretary) said that he felt the result of this meeting would more firmly cement the good relations that already existed.

The Chairman, Mr. H. T. Symons, expressed the opinion that relations now existing between the management and employees compared favourably with those enjoyed prior to nationalisation.

Sulphuric Acid Plant

THE Power-Gas Corporation, Ltd., has announced the conclusion of an arrangement with Chemiebau Dr. A. Zieren G.m.b.H. of Nieder-Marsberg, Germany, whereby it is able to manufacture and sell a complete range of sulphuric acid plant and associated equipment to Chemiebau designs.

The arrangement with Chemiebau covers processes for the production of sulphuric acid from hydrogen sulphide, sinter gases, sulphur, pyrites, spent oxide, gypsum, and other sulphur bearing materials in both vanadium contact and 'Intensiv' tower type plant.

The arrangement also covers the manufacture of auxiliary and related equipment comprising vacuum and high concentration plants, mechanical sulphate burners, rotary furnaces, reduction kilns, and electrostatic filters for dust and mist precipitation. The Power-Gas Corporation intends to contract for complete installations including erection and initial operation.

Four Regional Meetings between representatives of local authorities and other interests with members of the District Committees of the North Western Gas Consultative Council have been arranged this month at Lancaster, Chester, Manchester and Preston, when the North Western Gas Board's third annual report will be discussed.

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Town Gas for

Radiant Heating in Industry

By F. W. LOCKWOOD, Assoc.M.Inst.Gas E., and D. J. DAVIES,
Watson House, North Thames Gas Board.

From a paper to the London and Southern Junior Gas Association

OFTEN an industrial engineer will be discussing with a consumer the industrial heating equipment in a factory and be told that the heating apparatus or method of heating is satisfactory, but this sense of satisfaction is given by the consumer having used a type of heating for so long that he is unaware of possible improvement. If, however, the user is experiencing difficulties in a heating operation he will naturally stress this difficulty when discussing his heating plant. The knowledge of the existing difficulties helps the designer and influences the type of equipment to be recommended, and, generally, if the difficulties are in handling or in uniform heating of standard articles, then the modern trend is towards mechanical conveyors and to radiant heating.

When designing an installation for any specific purpose it is necessary to know the temperature to which the material is to be heated, the speed of heating and cooling, whether the maximum temperature has to be held for some specified time, the rate of throughput of the articles, and the space available. Sometimes, little information concerning the temperatures is available, while in other instances very precise details as to rate of heating, etc., are given and are claimed as essential to the process; in the latter case the information is often based on what has been found to work when the treatment is carried out in batch-type ovens or furnaces

Experimental Technique

Before deciding on a final design it is essential to study the problem experimentally and the results often show that the rigid time-tables sometimes laid down by the consumer do not have to be adhered to as closely as was thought necessary.

Ideally, the temperature of the source and the heating-up rate of the sample should be measured, but in practice it is often possible to measure one of these only and sometimes neither. In the last-mentioned case a simple inferential method of assessing the flux density of a radiant source may be adopted. This consists in measuring the heating-up rate of a square sheet of mild steel (18 s.w.g. is a suitable thickness), to the centre of which a thermocouple is fastened, while it is heated by the radiant source. If heating-up curves are plotted while the sheet receives radiation from sources of known intensity, the intensity of the unknown source can be assessed. This method facilitates the adjustment of a new installation if the heating-up rate of the sheet was measured when the initial experiments were performed.

Where possible, however, a fine wire thermocouple should be attached to the sample; this is not always an easy matter, but in the case of glass, thermocouples can usually be fused into the test piece while in other materials they may be inserted in existing or drilled holes, and although the exact temperature of the article may not always be indicated, a close approximation to the temperature may be given. By employing the same samples in the initial runs on the new installation, adjustments to the plant will be facilitated.

The results of a complete laboratory investigation into the possibility of annealing small glass photo-electric cells by high-temperature radiant heating has been published previously. It records the manufacturers' data, heating rates given by five thermocouples fired into the glass at strategic points while the sample was mounted in each of three possible positions, and the effect of varying the distance between the two radiant sources.

It is interesting to record that our first contact with the process of firing printed letters into the glaze of sillimanite spark plug cores was as far back as 1938, when the conversion of an electrically heated multitubular furnace to gas firing was required. This conversion was satisfactorily completed and, a year later, a second similar furnace was built. In the first of these two furnaces there were 20 nickel tubes disposed side by side sloping downwards from the charging position to the outlet end. These nickel tubes were built into refractory combustion chambers fired by a number of low-pressure aerated nozzle-type burners and the operating temperature, approximately 750°C., was controlled by a thermocouple, temperature controller, and motorised valve.

The printing machine was positioned at one end of the furnace and the spark plug cores were fed manually into the tubes and were then pushed down through the tubes mechanically. Air from a motor-driven fan was employed for cooling the cores upon discharge and also a small amount of air from another fan was blown up through the nickel tubes to create an oxidising atmosphere.

Although the conversion from electrical heating to gas heating was satisfactory, so much so that, as mentioned, a second furnace was ordered and built, there were considerable difficulties inherent in the design of the equipment. For instance, satisfactory baking results were not achieved for several hours until the furnace temperature equilibrium was reached and it was necessary, both with electrical heating and with gas heating, to employ several girls to examine all cores discharged. There was also considerable distortion in the nickel tubes, causing jamming and stopping of the passage of cores through them with consequent interruptions to the flow of work.

Revolutionary Method

In 1951, knowing that these troubles existed, suggestions were made to the management of this firm that they might, with advantage, consider an entirely revolutionary form of firing—by high-temperature radiant heating. Tests were conducted in the Watson House laboratories whereby printed cores were suspended between two standard gas fires fitted face to face and 6 in. apart with thermocouples embedded in the centre of each core to determine the rate of temperature rise and the ultimate temperature reached.

These tests showed that, with a radiant surface temperature of approximately 1,000°C., the cores reached a temperature of 700°C. in 4 min., and if they were left in the heating zone for 15 min. the temperature did not exceed 750°C. These cores were then examined by the consumers and pronounced satisfactory. In 1942 the first conveyor unit was designed and constructed. It measured 12 ft. in length, and consisted of eight identical units, fitted end to end, each unit being 18 in. long.

In this first unit the horizontal type of radiant bar was employed, backed with an insulating refractory brick. It was fired by post-aerated jets, the whole being encased in mild steel sheet and with a chain conveyor running beneath the unit carrying vertical supporting pins, 1 in. apart. The unit was immediately successful, so much so that within a few weeks

(*Continued on p. 337*)

the consumers themselves made modifications to the supporting pins whereby the throughput was doubled and then trebled.

The only fault experienced with this prototype tunnel was the mechanical weakness of the horizontal radiants and the method by which they were held in position. It was found that after considerable use the radiants were distorted and the vertical refractory rods holding them in position fractured and allowed the radiants to fall forward. A second tunnel was therefore constructed, using 'Portcullis' radiants but keeping the general arrangement of insulating refractory back block and mild steel casing. This was greatly superior to the first method, but troubles were still experienced with the radiant which, it must be admitted, had been considerably weakened by cutting in order to reduce the overall height to 5 in., and in this particular unit the back supporting hooks or lugs which are a feature of this type of radiant were retained.

However, these troubles were of a minor nature and the two tunnels, now both fitted with modified 'Portcullis' radiants, operated successfully for several years with, nevertheless, a certain amount of maintenance and repair work being done on them.

In 1949 major alterations to the design of this plant were undertaken in order to meet an ever increasing output and at the same time to reduce the amount of maintenance and to improve the appearance of the unit. Fig. 1 shows the latest form, in which it will be seen that the two tunnels are now fitted side by side and are covered with polished aluminium sheet to reduce radiation losses. The internal construction is shown in Fig. 2 and consists of shortened 'Portcullis' radiants standing on special cast iron plates beneath which post-aerated burner jets are fitted. Behind the radiants 2 in. thick moulded vermiculite insulating slabs are fitted; this material is also used for the roof, these slabs being loosely placed in a light steel frame, allowing for an insulating air space between them and the exterior removable polished screens.

FIG. 1

The conveyor chain is still positioned beneath the unit with vertical supports at 1 in. centres, each support holding three cores which move in echelon formation through the tunnel. Each tunnel now measures 18 ft. in length instead of the original 12 ft. The total output is approximately 120,000 cores per 8-hour working day, with a total gas consumption of 7 therms per hour.

The original multitubular furnace in operation in 1938 to 1940 gave an output of 2,000 cores per hour and it was necessary to light it at least 5 hours before production started at 8 a.m. With the present radiant heating system, production starts 5 to 10 min. after lighting.

In 1938 the percentage of badly fired cores was sometimes as high as 20. Now the finished core is automatically detached from its carrier and drops through chutes to collecting boxes. No examination is necessary as there are now no rejects.

Further advantages, apart from this considerable saving in labour and wastage of materials, are that the plant occupies less space, there is no replacement of nickel tubes, and there is practically no maintenance required on the present plant.

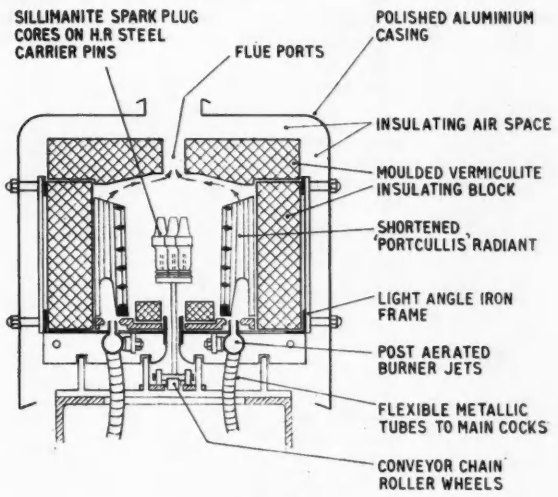
SILLIMANITE SPARK PLUG CORES ON H.R STEEL CARRIER PINS
FLUE PORTS
POLISHED ALUMINIUM CASING
INSULATING AIR SPACE
MOULDED VERMICULITE INSULATING BLOCK
SHORTENED 'PORTCULLIS' RADIANT
LIGHT ANGLE IRON FRAME
POST AERATED BURNER JETS
FLEXIBLE METALLIC TUBES TO MAIN COCKS
CONVEYOR CHAIN ROLLER WHEELS

FIG. 2

This manufacturer had used a conventional type of furnace for many years, and although he experienced many difficulties with it, not knowing of any better equipment, he was prepared to continue with the existing heating method. Immediately he was informed of the possibility of employing an entirely new form of heating and after witnessing a demonstration of this new technique in the industrial laboratory at Watson House, he saw the many advantages that could be obtained by changing from an old to a new method of heating. This is mentioned because it is felt that so often, when inspecting industrial premises, one accepts the consumer's version that the particular heating application in use by them is the only one possible for them, whereas in fact a considerable improvement in product and saving in labour and fuel consumption might be effected by adopting different and more modern techniques.

Heating Cathode Ray Tubes

Before radiant heating was adopted small batch-type gas-fired convector ovens or batch-type ovens with electric radiators fitted on side walls were used for this heat treatment.

Owing to the rapid growth of television, mass-production calls for conveyor lines and therefore the usual batch-type methods of heating cathode ray tubes are now being replaced by mechanical conveyorised ovens. It is usual to carry out this work of degassing cathode ray tubes in small quantities where two, three, or four cathode ray tubes are placed side by side, and a heated box-type convector oven is lowered over the tubes during the time in which the tubes are being degassed.

In this particular application the consumers knew that in America gas-fired conveyor tunnel ovens had been used for this process, and submitted photographs of plant that had been designed, constructed and used there. From this beginning drawings were prepared, in collaboration with consumers' planning engineers, of a gas-fired radiant heat tunnel 60 ft. in length and having a cross-sectional working space 21 in. wide by 21 in. high. A diagrammatic cross-section of the apparatus is given in Fig. 3, from which it will be seen that a trolley, moving on a fixed track, supports a quantity of pumping and other equipment, and above this cathode ray tubes connected to the pumping gear are supported. The conveyor with its trolleys and cathode ray tubes moves in one direction at a controlled speed and the tubes pass through a radiant tunnel, the general construction of which is indicated in Fig. 3. The radiating walls are constructed from $\frac{1}{8}$ in. heat-resisting steel

behind which is the combustion chamber, backed with moulded vermiculite insulating slabs, secured in a light steel framework and finally carrying external polished aluminium Sindanyo boards, incorporating air spaces for insulation and, above these Sindanyo boards, asbestos cloth is fitted to fill in as much as possible of the longitudinal gap that must exist to allow the free passage of the throat of the cathode ray tube and its supports.

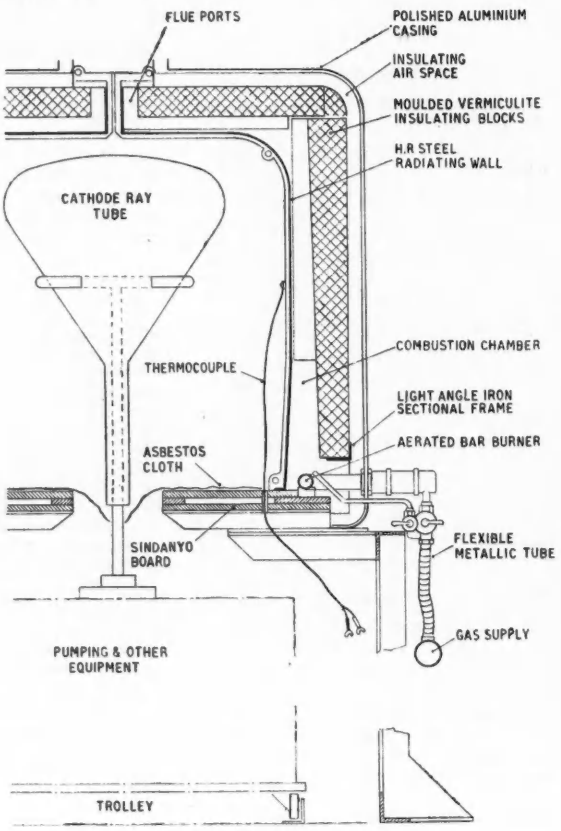

FIG. 3

The tunnel is heated by aerated bar burners firing upward through the tapering combustion chamber and the products of combustion are ventilated through small flue ports along the centre line of the roof slabs. The installation, which measures 60 ft. in length, consists of 20 identical 3 ft. long sections and each section is provided with a thermocouple attached to the centre of one of the vertical radiant walls. These thermocouples were originally fitted for checking temperatures, but in practice it has been found satisfactory to split the tunnel into four equal zones, each zone comprising five 3 ft. sections. A thermocouple is connected to the centre section of each zone and linked through temperature indicator controllers to motorised valves for automatic temperature control. Fig. 4 shows the tunnel, the conveyor holding the pumping gear and cathode ray tubes, as well as the panel with the four temperature controllers mounted upon it. Movement through the tunnel is intermittent; the conveyor moves for one minute and then stops for two minutes to enable the operators at the inlet and outlet of the tunnel to fit on and remove cathode ray tubes, as it will be appreciated that there is a certain amount of work to be done in joining up the glass tube to the pumps.

The operating temperature, which can be adjusted to meet varying requirements due to the use of different types of glass, is in the region of 500°C. in the first zone, approximately 550°C. in the second zone, 560°C. in the third zone, and 450°C. in the fourth and final zone. The total time of heating is 40 min.—*i.e.*, 10 min. passing through each zone.

The output of degassed 12 in. or 15 in. diameter cathode ray tubes in this size oven is 80 per hour. The gas consumption to maintain this tunnel at normal operating temperature is approximately 15 therms per hour.

Fluorescent Tubes

In the production of fluorescent tubular lamps and neon strip lighting the glass tubes are first filled with cellulose nitrate containing a fluorescent powder of activated calcium chlorophosphate, then drained, leaving a thin film of binder and powder on the interior of the tube. After this has dried the cellulose must be removed, leaving a thin film of fluorescent powder adhering to the inner surface. It is interesting to note the similarity that exists in producing this form of electric lamp with the method employed in producing a gas mantle. As is well known, a gas mantle is produced by weaving a fabric stocking which is then impregnated with salts of thorium and cerium; the fabric is ignited and destroyed, leaving a thin mantle structure of these salts. In the electric strip light the cellulose binder can be likened to the fabric stocking, its object being to hold and spread the fluorescent material evenly over the glass and, as in the gas mantle, it must finally be destroyed and removed.

Originally, this operation was carried out by rotating the glass tube horizontally above a nest of aerated bar burners, but the results achieved by this method were not entirely satisfactory, due to the burning-off being uneven and showing

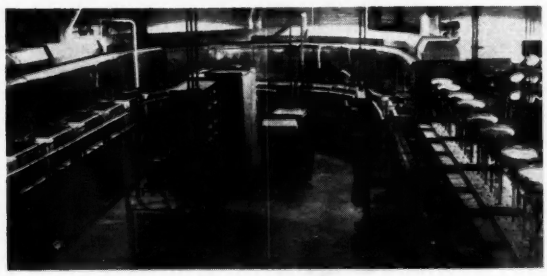

FIG. 4

striations corresponding with the flames when the lamp was illuminated. It was appreciated that this trouble was due entirely to the form of heating employed and that if the tube were heated evenly, say, by radiant heat, this marking or lining trouble would not occur. A laboratory demonstration and experiment was arranged which proved that radiant heating would be eminently satisfactory for this operation. The problem then was to manufacture a radiant panel or grill radiating downwards and measuring approximately 10 ft. 6 in. long by 18 in. wide, this length being necessary as the maximum length of tube to be treated was 9 ft. 6 in. At that time these manufacturers, although aware of the porous refractory type of radiant heater employing air under pressure pre-mixed with town gas, desired the heater to be of more simple construction if possible and similar to the conventional grill fitted on a domestic cooker and operating on low pressure gas.

A radiating unit of the dimensions quoted was therefore designed and constructed comprising seven 18 in. square units which were connected end to end to give a 10 ft. 6 in. long radiating surface. The radiating fret was formed of corrugated expanded heat-resisting steel fitted below moulded insulating refractory blocks. Low pressure aerated burners on each side fired towards the centre with the products of combustion ventilated through flue ports incorporated in the insulating refractory body. A cross-section of this unit is given in Fig. 5, which shows the fluorescent strip lighting tubes positioned approximately 4 in. to 6 in. below the radiating surface and 3 in. apart, being rotated and conveyed across the 18 in. width of heater. The 18 in. traverse from side to side takes 3 to 4 min., depending on size, during which time the tube is raised

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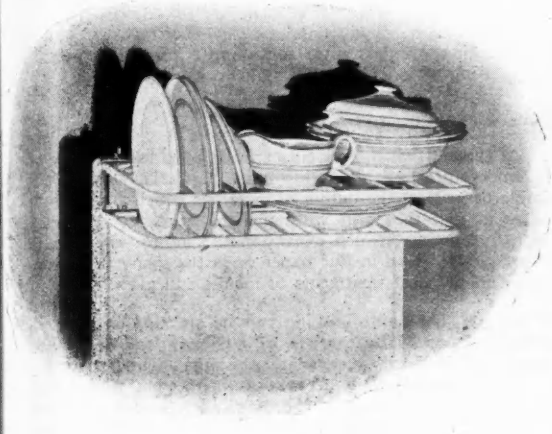


The convenience of its one-piece double platerack

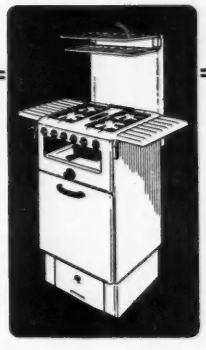
The platerack of the No. 20 CENTURY cooker is of stamped steel and is finished in vitreous enamel. It is hooked to pins on top of the backplate and is easily lifted off for cleaning or when necessary to accommodate a tall steamer on the hotplate. The double rack will hold up to sixteen plates standing on edge (two in each slot) or alternatively, four large plates of food can be placed on its two shelves when dishing up.

The enamelled backplate is self-supporting and requires no arms. It is rigidly secured to the back casing of the oven by means of two screws at either side.

Fitted with Hotplate Extensions

In CREAM Vitreous Enamel

Gas Cooker



452

to a temperature of 450°C. While being heated, small jets blow air through the tube interiors to accelerate the oxidation of the cellulose binder.

It will be realised that the glass tube softens at this temperature and, therefore, considerable care is exercised in the design of the supporting and conveying rollers to ensure that the tube retains its original straightness.

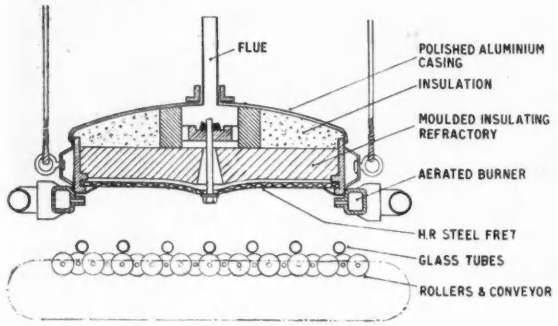


FIG. 5

As mentioned, this particular unit was originally designed for operation on low pressure gas, but in order to increase output it was necessary to increase the surface temperature of the radiants and, at a later date, this was achieved by using compressed and pre-mixed gas and air. This gave considerably higher temperatures but created additional trouble by shortening the life of the heat-resisting steel frets and increased maintenance costs.

These units were quite satisfactory for the original duty, but as additional loads were imposed the life of the radiants decreased; this phenomenon is not confined to gas appliances.

It is known that the porous refractory block type of radiator has been used successfully and so this original low pressure radiant grill has now been displaced by this type of radiator.

The new radiating unit measures 10 ft. in length by 2 ft. wide and comprises four 6 ft. by 6 in. wide and four 4 ft. by 6 in. wide rectangular units connected together as shown in Fig. 6 to give the required overall dimensions. Glass tubes varying from 9 to 37 mm. in diameter and from 6 ft. to 10 ft. in length are treated. The average output is 80 tubes an hour and the average gas consumption four therms an hour.

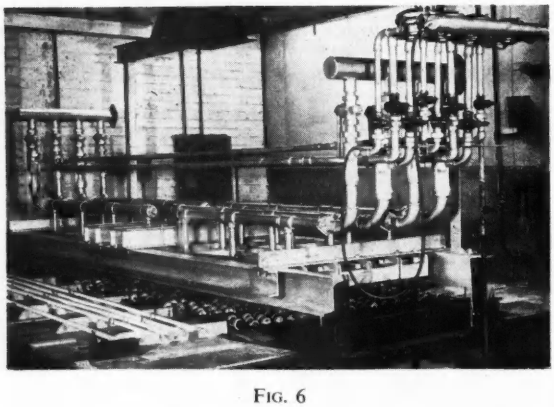


FIG. 6

High temperature radiant heating has also been used successfully for a number of other operations, such as the ignition and destruction of strengthening cottons incorporated during the weaving of asbestos cloth, the firing of gold, silver, and coloured enamels on to ornamental glass buttons, the brazing of various small brass articles, the curing of latex, the toughening of glass discs for aircraft instrument panels, and the fusing of indelible lettering in to glass ampoules.

Future Developments

It is suggested that there is an expanding field for the use of high temperature radiant heating units, particularly when it is desirable to increase the output of materials which are not heat sensitive in that they will withstand the impact of radiation of high flux density. Such expansion can be, for example, in the processes featured in this paper or in the many fields concerned with the heat treatments of metals and glass.

It may be that paint-finishing can be speeded up substantially where desired by the use of high temperature radiant heating; it is not suggested that substantially higher stoving temperatures are likely to be employed, but that where large numbers of articles of suitable shape require their painted surfaces to be cured rapidly, it may be possible to flash dry paints or lacquers which would withstand very rapid heating. The production of finishes suitable for such rapid drying is a subject which may be considered by the paint manufacturers.

Finally, there may be new applications for this form of heating and such operations as brazing or soldering of small articles would appear to offer opportunities for expansion to the present field.

Qualities of Management

IN his presidential address to the Institution of Mining Engineers, Professor J. Cecil Mitcheson, recently appointed to the Chair of Mining at the Imperial College of Science and Technology, quoted this from the Reid Report: 'It is not enough for the training of underofficials for the higher posts to be directed simply to progressive education in mining principles and practice . . . men who hold the higher posts must be not only technically competent, but must also possess their full measure of other qualities, such as powers of leadership, labour management, organisation, resourcefulness and experience.'

These qualities, said Professor Mitcheson, embraced much. For example, leadership. A good leader would be trustworthy in all his actions and would have a keen sense of responsibility both to those below and above him, as well as to the nation itself.

Britain had not yet accepted the fact that unpleasant changes were demanded of her by her new and lowered status in the world in this mid-20th century. The difficult economic adjustments immediately ahead would demand goodwill, hard work, and sacrifices by all classes if they were to be successfully overcome. The coal industry with its tightly knit structure covering so large and influential a proportion of the workmen of the country and with its vital importance to all industry must be one of the decisive factors in this situation. How it reacted could make all the difference to the outcome of the crisis. Did they equally realise that what the coal industry did or did not do in the crisis depended not upon its equipment nor upon its organisation, but upon its men, the workmen, and the management and the ideas activating them?

In conclusion, the speaker said they had many loyalties in the industry and, indeed, were famous for the manner in which they adhered to them. While it was right than a man should possess a strong sense of loyalty, unfortunately even when the objects of loyalty were in themselves good, they could conflict and so lead to strife and division. For mining engineers these lesser loyalties could well be merged into one great loyalty—that of loyalty to their profession. This privilege was great and their responsibility heavy. By their actions they must endeavour to ensure that right ideas should dominate the industry and then indeed they might look forward with a firm hope to the birth of that new spirit of unity and co-operation which, coupled with the current remodelling of the collieries, held such promise for the future of this great venture in nationalisation.

Town Gas for

Manufacture of Domestic Pottery

By K. DAVIS,
Stoke-on-Trent, West Midlands Gas Board.

From a paper to the Midland Junior Gas Association

THE making of articles from clay is one of the oldest of human crafts, dating back to prehistoric times when no doubt men first observed that the plastic properties of clay were changed when dried by the heat of the sun or fire, and became hard, thus making vessels suitable for use in everyday life.

Modern ceramic art covers a very wide field indeed, and includes the manufacture of all types of domestic and art pottery, bricks and tiles for building and decorating purposes, sanitary and sewage ware, refractories, products for the chemical industry, and insulators for all sections of the electrical industry. All these products are made in the Potteries, and town gas is playing a leading part in the manufacture of them all. However, the subject-matter of one single process, in the manufacture of one particular article, is sufficient for a number of papers, and this paper, therefore, is confined to the use of town gas in the manufacture of pottery in the earthenware and bone china clays and for the most part the subject is only lightly touched upon.

Earthenware clay is used for the manufacture of domestic and art pottery, wall tiles, and sanitary ware. The term earthenware is given to a mixture of ball clay, china clay, flint, and stone, with the addition of a cobalt stain which is added to whiten the clay in the same way that household blue whitens the clothes on washday.

Ball clay gives plasticity to the body and strengthens it after drying, china clay gives whiteness, and flint opens the body and allows even expansion during firing. Stone is a flux giving vitrification, hardness, and strength after firing.

The Process

These materials are first ground very finely either in the dry state or in water. The flint is first calcined to enable the material to be more easily ground. If the materials are ground in water we now have separate slips of each ingredient, and a proportion of each of these slips is mixed together in an ark to provide earthenware clay slip. If ground dry, the materials would be weighed and mixed in the dry state and then formed into earthenware clay slip by the addition of water. The earthenware slip is now passed through vibrating screens to remove coarse particles, through electro magnets which remove particles of iron, and then to a filter press to remove surplus water.

The filter press comprises recessed frames of wood or iron with filter cloths between each frame, thus forming a series of separate chambers. The slip is pumped into these chambers and the press is screwed up. The pressure forces out the water and leaves behind plastic cakes of earthenware clay. These cakes pass through a pug mill and de-airing machine which extrudes the clay as a homogeneous mass free from air pockets and ready for the maker.

There are four main methods of shaping the clay or slip into articles. They are throwing, pressing, jollying, and casting. Throwing is nowadays used only to obtain special shapes, the other methods being mainly employed. Pressing is used almost entirely in the manufacture of wall tiles and electrical porcelain.

The plastic clay from the filter press has a water content of approximately 30% and for pressing purposes this has to be reduced to about 7% by gas-fired driers. These driers may range in design from an ordinary brick-built stove where the plastic cakes of clay are placed on racks with rails of neat jet burners positioned around the base of the stove, through numerous types of drier employing recirculated hot air supplied from direct heated gas-fired air heaters, to the continuous drier where the plastic clay is extruded into thin sheets onto a stainless steel belt and conveyed through a tunnel using natural draught or air blast burners and hot air recirculating fans. One of these driers will deal with approximately 1 ton of clay per hour and have a gas rate in the region of 1,400 cu.ft. per hour.

After drying, the clay is disintegrated into a fine powder and the articles are die pressed from this powder.

Jolleyed ware is made from plastic clay on a revolving plaster-of-paris mould. A pancake of clay is placed on the mould and the article is shaped by a former while the mould is revolving. Some articles, particularly holloware, are made by casting them in plaster mould, and this method employs the earthenware clay in the form of a dense slip.

Articles which have been formed by any of the foregoing methods must now be dried, and it is in these drying operations that town gas begins to play an ever-increasing part in the manufacture of clay goods. Drying used to be carried out on racks in rooms heated by steam coils or stove pots and it would usually take 24 hours or even longer before drying had occurred to a sufficient extent to release the clay article from the mould. Excessive handling of the fragile clay goods, coupled with the fact that clayware will often crack if subjected to temperatures above 80°C. and that plaster moulds are seriously damaged by temperatures in excess of 70°C., causes serious loss in moulds and wastage of labour in re-making damaged articles. Moreover these methods of prolonged drying meant that large numbers of moulds were required in circulation for a given daily output of each particular piece of ware.

An Ideal Fuel

Town gas, with its ease of control of both temperature and humidity, is an ideal fuel for these drying operations and the present shortage of gas in the Potteries area is the only curb to the installation of large numbers of driers for this purpose.

During drying the interior of the clay must be kept at as close a temperature to that of the outer surface of the clay as possible, otherwise skin drying would result in unequal shrinkage and build-up of internal vapour pressure in the clay which would cause cracking. These cracks are sometimes so fine that they show up only in later stages of firing when the articles would be completely useless and serious loss could occur. Humidity in driers is therefore very important and the usual practice is to subject the ware to warm air in which the humidity is slowly reduced while the temperature is kept constant. In tunnel driers, warm air, which is usually supplied as waste hot air from the cooling end of the biscuit or glost firing tunnel kiln, is introduced into the exit end of the tunnel drier and moves in contra-flow to the direction of the ware towards the entrance, thus increasing in humidity as it passes through the drying clay goods. In the modern factory the making shops are sited close to the tunnel ovens with the express purpose of utilising waste heat from the tunnels for drying.

Gas-heated driers for clayware are numerous in design but perhaps the most popular type is the semi-continuous stove known as a dobbin. In this drier hot air is provided by a direct gas-fired air heater, and jets of hot air are directed on to the mould holding the clay article and then recirculated. Provision is made for the intake of fresh air into the system and for a controlled quantity of saturated air to be discharged from the drier to atmosphere.

The air heater comprises from one to three rows of industrial jets positioned so that each burner will ignite from its neighbour. The burner is protected from flame failure by a solenoid-operated gas valve held open by a thermocouple positioned in the pilot burner flame. Products of combustion from the burner together with danger controlled fresh air, are drawn into the recirculating system by the recirculating fan and the temperature of the air entering the drier is controlled by a thermostat positioned in the air stream and operating a relay valve on the gas line. An electrically maintained gas valve is wired to the electricity supply to the fan ensuring that gas passes to the burner only when the fan is running.

Fig. 1 shows a circular dobbin drying flat ware on plaster moulds. The newly-made clayware is being placed on shelves on the left of the opening while dried clayware and moulds are being taken out from the other side. The dried moulds are of course ready for re-use by the maker immediately after the dried clay article has been removed. This drier will deal with 360 5-in. plates or saucers complete with their moulds per hour,

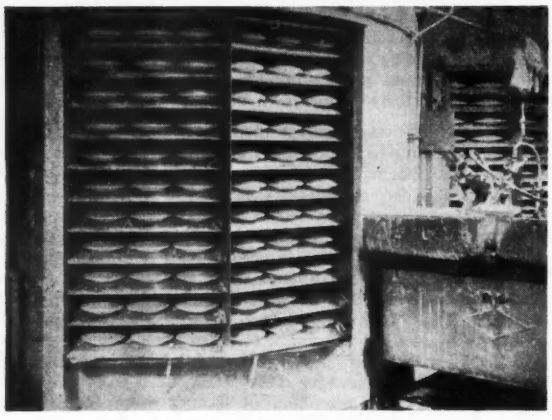


Fig. 1.—Circular Dobbin.

and the time taken for an article to pass through the drier is 1½ hours. This, compared with 10 hours or longer in the old type coke-heated stove, gives some idea of the amount of moulds saved by the gas-heated drier which is entirely automatic and foolproof in its operation, only requiring the operation of a switch to put it into or out of operation at any time. The gas rate is 250 cu.ft. per hour, giving 1.44 plates and moulds dried per cu.ft. of gas used.

Bone china clay is used for the manufacture of domestic pottery and art goods, figures, vases, brooches, etc., and is a mixture of china clay, bone ash, and stone. The bone ash is obtained by calcining the bones of oxen, and some of this calcination is carried out in the Potteries in gas-fired furnaces. The bone ash gives translucency to the china body, acts as a powerful flux during firing, and, with the stone, gives hardness and strength after firing. The china clay gives whiteness to the body and the combination of these materials results in an intensely white cold translucent article easily distinguishable from that of earthenware.

The method of preparation of bone china plastic body and casting slip and the methods of shaping ware are similar to that of earthenware, but the absence of plasticity due to the absence of ball clay results in a 'lean' body which, although easily dried, is much more fragile than earthenware and requires very delicate handling in the clay or green state.

After drying, both earthenware and bone china clay articles are sponged and fettled to remove rough edges, the feet of cups, etc., are turned out on a lathe, handles are stuck on, and after further drying are passed to the placer for the first firing.

The effect of heat on clays is the basis of the manufacture of all ceramic goods and is the subject of research spreading back over a long period. The rate of temperature rise, the final firing temperature, the period of soak, and the final cooling are all critical throughout the firing curves and the use of town gas for this purpose since 1932 has completely revolutionised the entire pottery industry.

The age-old method of firing was in intermittent coal fired 'bottle ovens.' The dried clay ware is bedded in alumina powder in fireclay containers called 'saggars,' which protect the ware from the effects of flame, soot, and sulphur. These saggars are hand placed one on top of another to a height of 10 to 20 saggars and the entire interior of the oven is filled with these bungs of saggars with spaces left between the bungs for the passage of hot gases from the firemouths.

The ratio of weight of saggars and alumina per pound of ware in these ovens is in the region of 10 to 1 and the heat required to raise this setting material, together with the heat loss in allowing the oven to cool after each firing, brings the efficiency of firing of the ware down to below 2%.

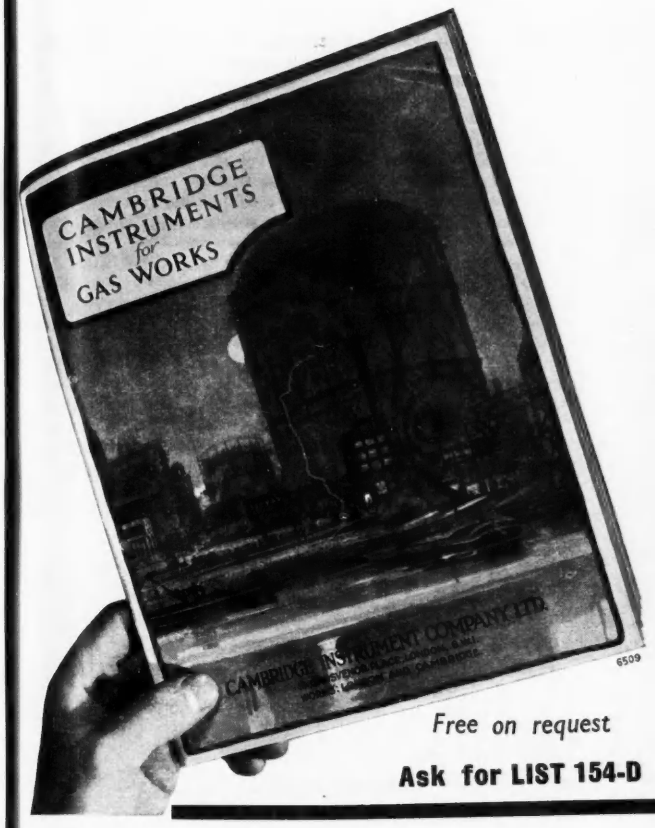
Earthenware clay is fired to temperature of 1,150°C. to 1,250°C., while bone china clay is fired to around 1,300°C. The firing of china clay, however, is a much more difficult process than that of earthenware as the firing range is very short and the clay has a very high shrinkage of around 12½%, which causes cracking and warping. Over-fired ware deforms rapidly while under-fired ware is very porous and causes crazing in the glaze in the later processing. In the intermittent 'bottle oven' the filling and emptying of the oven requires great skill and physical strength and the loss due to careless handling of saggars and ware is considerable. During firing a number of saggars become deformed and broken due to the weight to which they are subjected. The methods of control of temperature in the oven are exceedingly crude and in fact every baiting put on the fires causes violent changes in temperature and variations of atmosphere in the oven from reducing to exceedingly oxidising. It is astonishing, in fact, that any first-class ware is obtained by this method of firing, and only the careful siting of different types of ware requiring different firing temperatures, and the experience of the firemen over many years, ensure the success of the operation. Even so, the percentage of faulty ware is very high and in the region of 13%.

Changing the Picture

The advent of town gas in continuous ovens has, of course, changed this picture. Complete control of temperature across the cross section of the truck and of the whole firing curve is obtained. Handling is cut down to a minimum and the loss of heat and wear and tear on the oven structure brought about by intermittent heating and cooling are completely eliminated. The production of fired ware is constant, thus enabling the labour required for placing and off-loading to be cut to the minimum. Trucks can be loaded at the most convenient time during the normal working day and trucks holding fired ware can be run into sidings for convenient unloading. The tunnel forms part of a continuous conveyor system of manufacture ideally suited for the continuous output of pottery. The loss in a gas-fired continuous tunnel due to firing faults is less than 1% and the total loss from all causes is less than 5%.

The open-flame multi-burner type tunnel shown in Fig. 2, where gas is burnt in the actual tunnel, lends itself ideally to the firing of clayware to the biscuit state. A turbulent oxidising atmosphere is required which will circulate the products of combustion through the ware giving uniform distribution of heat through the setting and carrying away the mechanical and combined water contained in the ware together with the gases given off by the burning of the carbonaceous matter in the

(*Continued on p. 346*)



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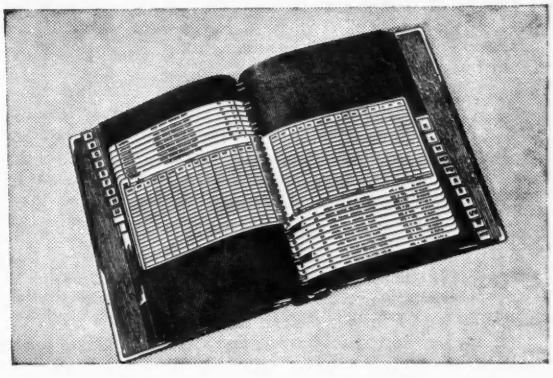

Appliance Maintenance Record
Appliance Order Record
Case and Container Records
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clay as it is heated. Turbulence is brought about by using air-blast burners, gas/air mixture burners, or semi-high pressure gas burners injecting the products at high velocity into the tunnel, and also by the use of suitably placed recirculating fans taking hot gases from the top of the setting and returning them to the base.

Fig. 2.—Open-fired Multi-burner Tunnel.

The tunnel shown is firing earthenware tiles from clay to biscuit state. It employs a gas/air mixture to the burners supplied by a Selas mixing plant. The gas/air ratio is 1 to 1¼ and the pressure is 18 in. w.g. The tunnel is 281 ft. long and has a cross-section placing space of 42 in. square. The clay tiles are open-placed on the truck and each truck carries 35 cwt. of tiles, representing 155 sq. yds. of 6 in. tiles ¼ in. thick.

The weekly output based on the above is 134.15 tons of tiles, or 11,935 sq. yds. of 6 in. by 6 in. by ¼ in. tiles. The gas consumption is 4,500 cu.ft. per hour, or 3,553 therms per week. From this we get figures of:—

84.92 lb. of fired ware per therm; or
120.9 6 in. by 6 in. by ¼ in. tiles per therm.

These tiles are fired to a temperature of 1,100°C. and the cycle of a truck passing through the tunnel is 96 hours. Pure hot air from the cooling zone of the tunnel is available for use in clay driers or for space heating and amounts to 4,540 cu.ft. per min. at a temperature of 190°F.

A typical tunnel for firing earthenware biscuit pottery is 240 ft. long and has a cross-section placing space of 4 ft. 3 in. high and 3 ft. 7 in. wide. The tunnel is open-fired and there are 55 bottom horizontal burners and seven top vertical burners on each side—a total of 124 burners. These burners are divided into eight groups and each group can be separately controlled either manually from main group valves or automatically from thermocouples fixed in the crown of the tunnel and operating motorised gas valves on each group.

In such a tunnel the weight of mixed pieces of ware (cups, saucers, plates, etc.) fired per week is 97,300 lb., and this averages 181,200 pieces per week. The weekly gas consumption averages 4,359 therms and we therefore arrive at figures of 41,568 pieces per therm or 22.32 lb. of ware per therm. The average price of gas at this factory is 7.96d. per therm and therefore the firing cost per piece of ware is 0.19d. and the firing cost per pound of ware is 0.356d.

Fig. 3 is a view of the preheat and firing zone of an open-fired tunnel firing earthenware biscuit pottery. The burners in this case are of the natural draught type supplied with damper-controlled preheated secondary air from a duct underneath the burner positions. The horizontal bottom burners and vertical top burners can clearly be seen and these burners are divided into groups and controlled automatically and separately on each group.

Flat ware is very prone to warping during firing as it cannot support its own weight and must therefore be supported. It is usual to bed flat ware in alumina powder in saggars or alternatively in bungs of refractory setters. A saggar is an oval fireclay container like a ladies' hat box without a lid. These saggars are made of local fireclay and fired in the tunnel when they are first made.

The rates of setting material to ware may vary from 1 to 1, to as much as 6 to 1, according to the setting employed. The firing temperatures of china and earthenware biscuit are 1,250°C., of china 1,350°C., of earthenware 1,150°C. to 1,250°C. When firing earthenware the removal of mechanically combined moisture in the clay state, which comes out at about 200°C., and the chemically combined water which is driven off at around 800°C., must occur very gently and evenly; otherwise cracked and warped ware would result. This means that the firing cycle for earthenware is longer than that for china, although the peak temperature of earthenware may be over 100°C. lower, and to obtain equal output of earthenware as china a longer tunnel must be employed.

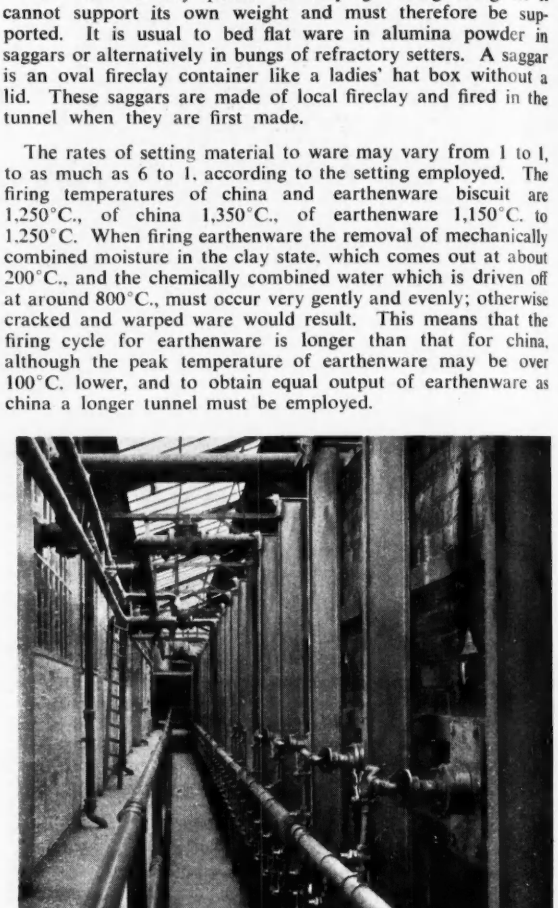

Fig. 3.—Open-flame Tunnel, Firing Zone.

After biscuit firing, which turns the clay body into a hard brittle porous article, it may be required to apply underglaze decoration before the ware is glazed. Underglaze decoration has the advantage that it is completely covered and protected by the glaze and is therefore impervious to the wear and tear to which it may be subjected in the home. The colours used for decoration are metallic oxide pigments mixed in oils and gum, and earthenware biscuit is so porous that these soak into the body and would prevent glaze from adhering to the surface if they were glaze-dipped at this stage. The ware is

therefore passed through a hardening-on tunnel which raises the ware to a temperature of approximately 600°C. This burns off the oils and fats and leaves a matt surface ready for the application of glaze. China biscuit, being almost non-porous, does not require this firing.

Glaze gives a glassy coating to the ware. It is made from a mixture of materials, the principal ones of which are borax, lead bisilicate, china clay, flint, cornish stone, whiting, and soda ash. Some of these materials are soluble in water and therefore have to be made water insoluble by vitrification into frit. Frit firing is carried out in gas-fired furnaces using air blast burners. Fritting temperatures may be as high as 1,350°C. to 1,400°C. and to obtain these temperatures quickly and efficiently preheated air is supplied to the burner by passing the air for combustion through ducts running under the floor or along the side walls of the furnace. A typical gas-fired furnace for frit melting, using two eddy-ray burners, shows output figures as follows:

Weight of charge 'on' 900 lb.

Weight of charge 'off' 640 lb.

Firing time 3 hours 15 min.

Gas consumption per charge 32 therms, giving a figure of 20 lb. of frit 'off' per therm.

Such a furnace will normally run continuously 24 hours per day for 10 weeks or more before furnace repairs are required. Originally, when the furnace was coal-fired, 6 cwt. of coal was required per charge, giving a figure of 91 therms per charge, or 2.8 times the heat requirements on town gas, and the furnace had to be let down every week end for repairs.

Fig. 4.—Infra-red Glaze Drier.

Frit is very susceptible to atmosphere, and reducing conditions in the furnace result in a brown discoloured product which would cause variation in glaze quality. Brown charges were very common when coal-fired, but never occur with gas-firing, owing to the complete control obtained. Identical charges over a whole 10 weeks fritting period are obtained, and the saving in labour, furnace repairs, and fuel brings the cost per charge with town gas well below that obtained with coal.

The vitrified frit is mixed with the other ingredients contained in glaze and these are ground in water to form glaze slip. The biscuit ware is dipped into the glaze slip and then dried to leave a dry coating of glaze powder adhering to the ware.

Glaze drying is carried out very successfully by infra-red panels, although various types of drier are in use using hot air recirculation from gas-fired air heaters.

Fig. 4 shows an infra-red drier comprising low temperature panels. The ware is dipped into the glaze slip and placed on the endless belt. The drier is 12 ft. long and the time through the drier is 15 min.; 1,128 pieces per hour pass through the drier and the gas consumption averages 280 cu.ft. per hour, giving just over four pieces of ware dried per cu.ft. of town gas. Large numbers of this type of drier are in use in the Potteries at the present time and many further installations will be put in when further supplies of town gas become available.

After receiving a coating of glaze powder, the ware now passes to the glost oven, where the glaze is melted to a glassy finish at a temperature ranging between 1,040°C., and 1,150°C. In glost firing the ware must be kept separated or the articles would stick together into a solid mass. The ware may be placed in saggars and each piece separated from another by means of refractory thimbles, spurs, stilts, etc., or it may be placed open on cars and separated by special refractory supports.

Different Technique

Glaze firing requires a different technique from that of biscuit firing. The atmosphere around the ware must be oxidising and must be as still as possible. At the same time, volatile gasses given off by the glaze must be carried away. A turbulent atmosphere in a glost oven would carry away part of the glaze coating, giving the glazed ware a starved appearance and robbing it of the brilliant glossy shine characteristic of good pottery. Also dust particles would be blown about by the turbulence and deposited upon the tacky surface of the molten glaze causing spoilage. For these reasons a number of tunnels in the Potteries firing glazed ware are muffled or alternatively the ware is place in saggars and the tunnel open-fired. This, of course, results in a higher consumption of town gas per pound of ware fired, and nowadays more and more firms are turning to complete open-placing of ware in open-fired tunnels. The burner equipment on these open-fired glost tunnels is mostly natural-draught and a soft semi-luminous flame is employed to give a minimum of velocity of products and high radiation of heat from the flame. Muffle type tunnels employ air-blast burners using preheated air from the cooling end of the tunnel.

The decoration of pottery is, of course, the final touch to the masterpiece which in the course of its manufacture has been handled and worked on by dozens of craftsmen and women. Some ware has a self colour which has been added in the form of stain to the clay when it was first being prepared in the mixing ark. This self colour was a very difficult process to fire when the firing was carried out in 'bottle ovens,' as the ware came out in different shades if subjected to varying temperature, and pieces had to be carefully matched. The gas-fired tunnel has completely eliminated this particular fault.

Other ware is coloured by using coloured glazes which are obtained by adding metallic oxides to the glaze slip, and here again varying temperatures would cause varying shades of colour.

Tiles and sanitary eathenware are coloured by this means and the mottled effect on tiles is brought out by dabbing glazes containing different oxides on to the tile surface.

Underglaze and on-glaze decoration on pottery may be applied by hand painting, banding, spraying, stencilling, stamping, or printing. Printing is carried out by using an engraved copper plate on which the design has been reproduced. The colouring material is a sticky mixture of metallic oxides and oils, and this is spread onto the surface of the plate by a palette knife. The plate and the colouring material must be kept warm to enable the colour to enter the fine engraving on the plate, and this is ensured by keeping both colour and plate on a gas-heated printer's stove, as shown in Fig. 5. This plate is an ordinary oatcake stove, and a battery of these stoves is used to serve a number of printers.

After the colour has been spread on the engraving, the surplus colour is scraped off and the plate 'bossed.' A thin sheet of rice paper is placed on the plate and both are passed